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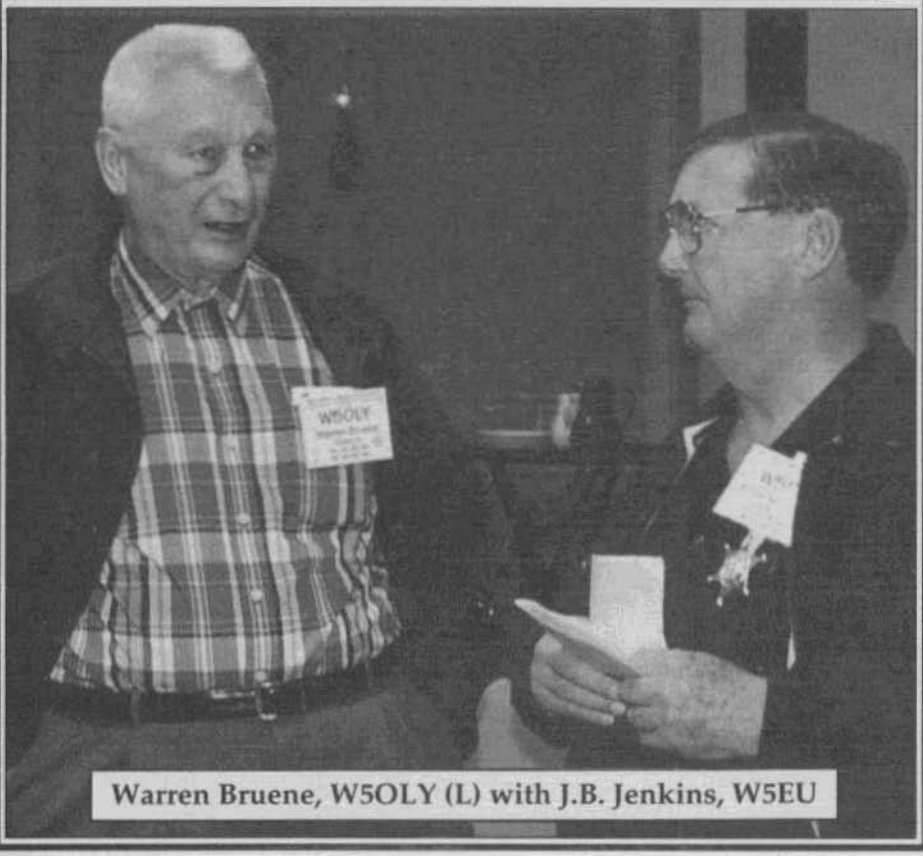
ELECTRIC RADIO

celebrating a bygone era

Number 118 February 1999



Warren Bruene, W5OLY (L) with J.B. Jenkins, W5EU

ELECTRIC RADIO

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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

We depend on our readers to supply material for ER. Our primary interest is in articles that pertain to vintage equipment/operating with an emphasis on AM, but articles on CW and SSB are also needed. Photos of hams in their hamshacks are always appreciated. We invite those interested in writing for ER to write or call.

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK; Thomas Bonomo, K6AD and others.

Editor's Comments

As I write this my beautiful bride, Shirley is up in Salt Lake City recovering from injuries she received in a car accident about 2 weeks ago. The good news is that her injuries were not extensive, although they certainly could have been, as she was involved in a head-on collision. Just as soon as I get this issue into the mail I'll go up to SLC and bring her home. She'll be on light-duty for some time but she's expected to make a full recovery and be as good as new.

Our lives can be changed in a heartbeat. This has been made very clear to me. I think that from now on I'll appreciate every good day and try to get the most out of life. I've realized that the important things in life are our family and friends. We shouldn't be totally preoccupied with our jobs, our hobbies or our little problems. Sorry if I sound a little preachy.

Expect to find more than the normal amount of typos and other errors in this issue. Shirley helps me with proofing by reading all the manuscripts to me as I follow along on the computer making sure that all the data was entered correctly. I didn't attempt to find someone else to help me, I've just tried to do the best that I could by myself. Of course, the magazine was proofread by our longtime proof reader Dick Houston, WØPK, but he only has the finished product to go by.

I've started planning for the 3rd Annual ER Sponsored Vintage Field Day. Tentatively I've set the date as the weekend of June 19/20. I'd like to have input from those who plan to participate, not only on the date but on anything else that might help make the event successful. I've already decided that we'll be returning to Muley Point out in Utah for VFD. More about this in the next issue.

And lastly, I'd like to bring your attention to the good news that longtime ER contributor, Bob Dennison, W2HBE, is back with us. Bob had a stroke about a year or so ago and was in pretty bad shape for a while. Speaking for myself and all ER readers, I want to tell you Bob that we're all happy you've recovered. And keep those articles coming! N6CSW

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Looking Back

by Lew McCoy, W1ICP
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One person I haven't really mentioned, who worked at the League at the same time as I did, is Laird Campbell, W1CUT. Not long after I was hired (1948), by Ed Handy, the Communications Manager, Handy hired Laird. Laird was out of Pampa, Texas (Laird, did I spell that right?) which as I recall, is near Amarillo.

I am trying to recall exactly what Laird's job was in the Communications Department—I believe it was sorting DX cards. At that time almost everyone who was hired on by the League started at the bottom and sorting DX cards was certainly the 'bottom.'

Laird and I had many common interests and we did spend considerable time together. Like me, he got fed up with the Communication Department and as I recall, he was unhappy and going to quit. Laird may not remember this but I talked him into seeing George Grammer, our Technical Editor, for a job in the Technical Department. Laird took over and ran the Hints and Kinks section of QST for many years. The 'Hints and Kinks' section of QST was alway the most important column in the magazine and probably the most widely read. Laird certainly did a good job running it. At this time he also was involved in developing technical articles for QST.

One "first" for Laird, and I remember this very well, was the first solar powered contact. Laird designed a QRP rig which was powered by a very simple solar cell. The transmitter ran only a fraction of a watt. He used me as one of his guinea pigs when he made the first contacts. I don't recall the QST issue but it was written up in QST. Another project he was involved with was the development of the Z-Match type antenna coupler. I am not sure but he may have been the first to come up with the Z-Match circuit. (I never really liked the Z-Match because it was possible to mistune it and then it became a dummy load. But it was a good circuit if one was aware of the problem.)

Laird married a very beautiful girl who worked at ARRL in the advertising department and as I recall, as most of the League employees, she was also a ham. I had the honor of giving the bride away at their marriage. Laird what wonderful memories!

Laird stayed in the Technical Department for several years and then moved over to the Production Department and became Managing Editor of QST, a post that he held from about 1966 until 1972.

One of the things that Electric Radio readers probably don't know is that the Managing Editor is responsible for the actual physical production of the magazine. And this job is as important as (or more so) than any other on a magazine. In my opinion, Laird excelled at this job. I might add here that Laird was very well liked by everyone who came into contact with him at the League. He was a very charming man who never had a bad thing to say about anyone.

One other important point about Laird is that, he is the only radio amateur that I know of that has a complete collection of everything that ARRL ever printed—even including some of the stock certificates from the very early days. I'm sure that what the League has in its archives does not compare at all to Laird's collection.

Laird, like myself, was and is a historian with interests in Amateur Radio, particularly ARRL. I know that Laird gets Electric Radio so he will be reading this. Laird is presently living in a retirement community in Texas. Laird, I hope you're feeling well. W1ICP

N2KSZ Memorial 160-Meter Contest Results

We received nine logs from operators who participated in the N2KSZ Memorial 160-M contest over the weekend of December 26/27. The first place winner is Paul Johnson, W9PJ, with 80 points. Right behind Paul for second place is Jack Shutt, N9GT with 53 points. Dave Humbertson, W3NP, came in third with 43 points. Other scores were: Larry Szendrei, NE1S, 40 points; Doug Beard, KFØVF, 16 points; Ron Skipper, W8ACR, 15 points; Tim Walker, W1GIG, 12 points; Mark Mandelkern K5AM, 9 points and Herb Hildebrand, K9GTB, 6 points.

Here are some of the comments we received from the participants in the contest.

From Jack Shutt, N9GT:

"Enclosed please find my log for the 1998 Annual Electric Radio N2KSZ Memorial 160 M AM Contest. Again, I enjoyed participating In this event, however, the conditions here were variable and, at times the high noise level caused a few problems. There was also a bit of confusion on the part of many participating as to when the contest actually was to begin.

"I was also somewhat taken back by a couple of Wisconsin Am'ers on 160 who seemed to strongly object to any "contest" operation. I had my pedigree read to me by these individuals. Attempts to explain that this was not like the typical "5-9- hello-good-bye" type of contest seemed to go unheeded or unappreciated. Most of us who participated, however, had a great time.

"Highlights included working an old friend Wes, W7UO (formerly W9UO) on his Gates BC-1 broadcast transmitter and 180' vertical. Wow, what a signal into Indiana from Arizona!

"The rig used was the Federal 167B marine transmitter (pair of 813s modulated by a pair of 811As in a home brew modulator) with 300 watts output to an inverted L antenna. The receiver was a Collins R-390A.

"I would like to make a suggestion for a change in the rules to more clearly specify the operating time of the contest and to allow more effective use of night-time hours for 160-Meter operation. I suggest that the contest hours be stated in GMT, as is the case for almost all other contests, and that the time frame be extended to Include 0000Z Saturday through 0000Z Monday. This would equate to 1900 EST (7:00 PM) Friday night to 1900 EST (7:00PM) Sunday night. Giving contest times in Pacific Time causes confusion as well as limits valuable night-time operating hours for eastern stations. Several operators that I talked to were unclear if the contest started at midnight Friday or Saturday EST. This is precisely why most contests reference GMT as the standard to eliminate confusion. It would also provide a total contest period of 48 hours even though realistically, night-time hours are the only time that many contacts are completed on 160 meters."

Ed: Thanks for your suggestions Jack. Next year the contest times will be announced in GMT.

From Dave Humbertson, W3NP:

"I had a good time in the 160-M 'contest'. The rig I used most of the time was a T-368. My best DX was Bill, KDØHG in Colorado who had a great signal."

From Tim Walker, W1GIG:

"I knew Dave, N2KSZ and it was an honor to take part in a fun event in his memory."

We send our thanks to all who participated in this year's contest. Award certificates and a copy of the book "Hiram Percy Maxim" will be going out to the winners. N6CSW

The "Grid-Current-Less Wonder" AM Transmitter

by Robert H. Dilworth, W4LQE
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In the early 1960s my good friend Jesse Sherwood, then K4DLQ and now a silent key, made me aware of the unique RF circuit properties of very high perveance pentodes ("sweep tubes") when operated without grid current. Both of us built and enjoyed six meter AM rigs using these methods, and then put them away during the SSB era. When AM revived over a decade ago, I revived these old circuits and built AM rigs that have generated some interest in home-brewers, and which I will now share with ER readers. Jesse had a wry sense of humor, and gave these rigs the name "Grid-Current-Less Wonder". This article is dedicated to Jesse's memory.

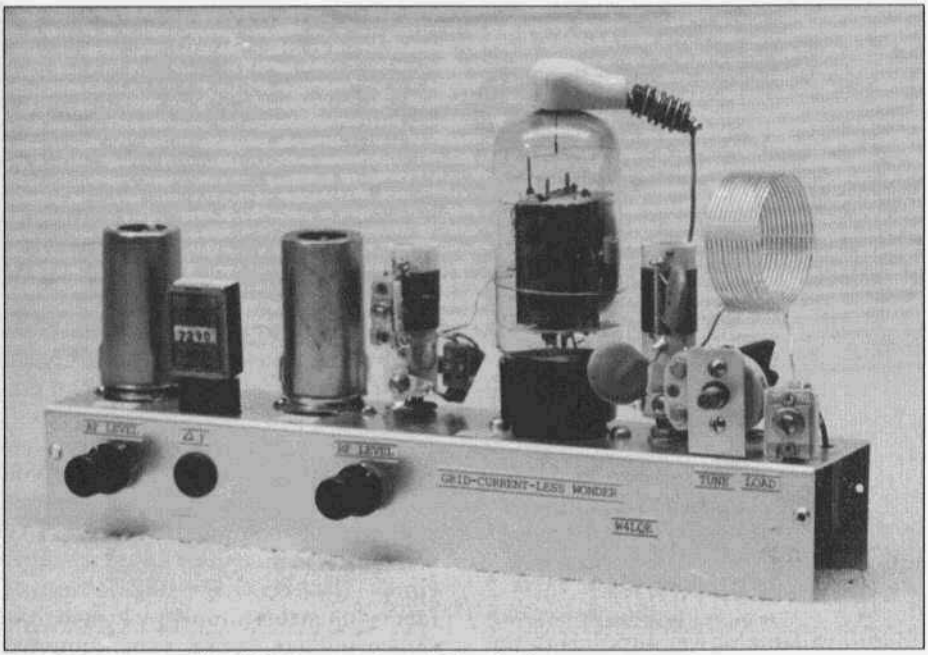
The "Grid-Current-Less Wonder" method, which I will abbreviate as "GCW", allows very simple transformerless AM transmitters that produce standard constant carrier AM output capable of 100 percent modulation with peak envelope power of 4 times the carrier level. The example for 40 meters described in this article uses only 3 tubes, and produces adjustable 0 to 25 watt carrier output - suitable for use alone or to drive a linear amplifier. I have tried to make this example easily reproducible.

The "secret" of the GCW does not lie in the circuits, which you can recognize as simple grid modulation. Rather, it lies in the choice of tube used in the final amplifier, and in the selection of grid bias and RF and AF drive levels.

Grid modulation is seldom employed with conventional class-C RF amplifiers, primarily because a grid driven into positive voltages and drawing grid current presents a nonlinear impedance to the modulator, inviting distortion. A modulator having the required power level and very low output impedance can be almost as complex as a plate modulator. These problems disappear if the RF amplifier is operated without grid current - that is, providing negative grid bias well past cut-off, but never driving the grid into the positive region. If you do this with conventional tubes intended for RF amplifier use, you will be very disappointed with the power output - 5 to 10 watts from a 6146, for example.

The advent of tube-type color television sets in the 1950s and 60s created a great demand for horizontal deflection tubes having 20 or more watts plate dissipation, and that required minimum drive circuitry and drive power. This strong economic impetus resulted in tube designs having tightly pitched grids closely spaced from the cathode, as well as high emission cathodes, so that ampere-sized plate current pulses could be obtained without ever driving the grid voltage positive. Examples include the 6DQ5, 6CU6, 6LQ6, and 6JS6, among others. These "sweep tubes" became well known in amateur radio designs as RF amplifiers, modulators, and linear amplifiers. However, essentially all RF amplifier applications used the tubes in the conventional manner, driving the grids into the positive region.

The GCW uses this special class of tubes (technically known as high perveance pentodes) in a grid modulated class-C amplifier. (Note that the fundamental definition of class-C relates to low duty cycle of the plate current waveform, not to grid conditions.) With the grid never going more posi-



25-watt 40 meter "Grid-Current-Less Wonder"

tive than zero, no actual power is required for grid input power. Of course, circuit losses in providing bias, RF and AF to the grid require a very small actual driving power. Figure 1 shows the basic grid circuit of a GCW. The RF amplifier grid is biased well past cutoff, with -150 volts being a suitable value for common sweep tubes. Adjustable RF drive is applied at a level to set the desired carrier output power. Adjustable AF drive is applied to the grid resistor, effectively adding the AF waveform to the RF waveform. Note that the only load for the AF drive is the grid resistor, which can have a typical value of 390K ohms. This very low AF drive requirement allows a 12AX7 twin triode to be the complete modulator. Fig. 2 shows the full schematic of a 25 watt 40 meter GCW. The accompanying photo shows the complete rig (less power supply) built on a 1-3/4 by 10 inch chassis.

Is this simplicity obtained without any negatives or complications? Of course not - there is no free lunch. However, having built over half a dozen GCWs, I find that the method compares well with conventional AM rigs. Here are the things that require special attention in a home-brew GCW:

1. The RF drive to the final amp grid must be smoothly adjustable by a panel control. We are used to providing "enough plus a little more" grid drive to a conventional class-C amplifier. The GCW grid drive must be set to just the right value. However, this also becomes the RF output level control, so when using a linear amplifier, you can set the power level with this control and never touch the output pi network of the GCW.

2. Sweep tubes are very sensitive amplifiers, and it is impossible to build a stable GCW amplifier without proper neutralization. Conventional amplifiers can often avoid neutralization circuits if carefully shielded.

3. The bias supply and the B+ supplies for all GCW circuits except the final plate voltage must be free of ex-

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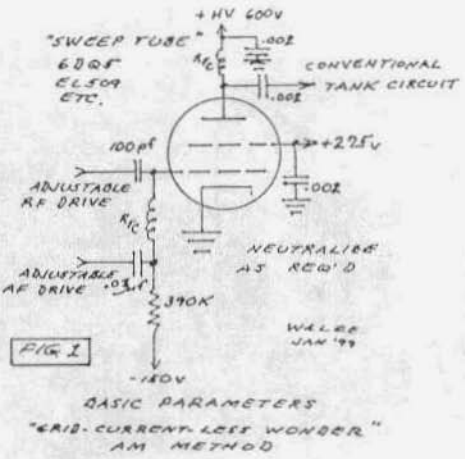


cess ripple. Ripple voltages on any of these supplies directly modulate the final grid. Since all of these current draws are small, simple RC filters can adapt available power supplies to the GCW.

4. Tune-up of a GCW is not successfully done by observing final plate current. It is imperative to use a peak-reading RF output meter. The RF driver and the final tank circuits are tuned for maximum output, but the RF and AF drive levels and the final tank circuit loading must be set for proper modulation peaks.

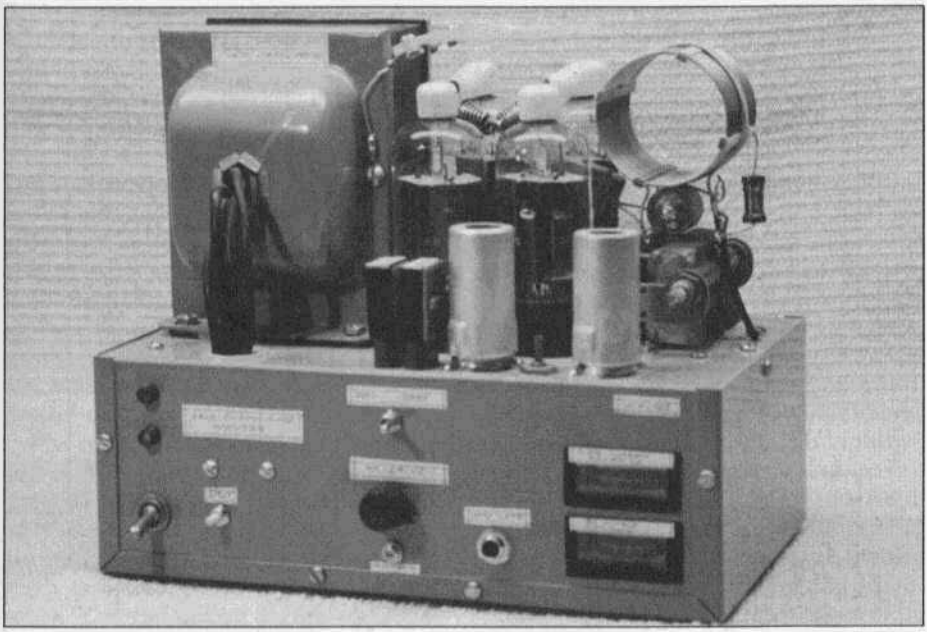
5. The GCW requires careful selection of the L/C ratio in the final tank circuit in order to secure full 100 percent modulation peaks that are 4 times the carrier level. In using a pi network final tank, the loading capacitor setting is chosen for adequate peak capability rather than output power level, and the adjustable RF grid drive control is used to determine output power level.

6. The efficiency of a GCW final amplifier is typically 35 to 40 percent - just over half that of a conventional class-C plate modulated final. However, the absence of filament and HV power required by a plate modulator makes the "wall plug" efficiency very closely equal. I have a 100 watt output GCW rig on 75 meters (push-pull-parallel 6DQ5s) that uses the identical power supply components as a 100 watt output plate modulated rig (6146s modulated by 6146s). The wall plug cannot tell the difference. The physical size and weight difference is considerable. The GCW sounds better - it is hard to screw up a single 12AX7 modulator!

The circuit diagram of Fig. 2 has nothing unusual in it. The crystal oscillator provides a trimmer for getting FT-243 rocks right on frequency. As shown, it accommodates crystals ground for 32 pF load. However, you can accommodate available crystals simply by changing the values of C1 and C2, keeping their ratios roughly equal. The RF driver stage output is made adjustable simply by varying the screen voltage with a panel-mounted pot. The RF chokes are not critical in value. None of the other component values are critical - you can use junk box resistors a standard value above or below those shown. Capacitor values for coupling or by-pass are likewise not critical.

The circuit shows conventional bridge neutralization of the final amplifier. I found that a convenient way to make Cn1, the plate coupling neutralization capacitor, was simply to wind one turn of bare wire around the final tube glass envelope, snugging it enough to stay in place. Placing the wire circle just at the bottom of the plate structure of the tube gives minimum capacity, and moving it upward toward the center of the plate structure gives greater capacity. For my particular layout, a fixed value at Cn2 of 330 pF provided the needed adjustment range to achieve neutralization. Other layouts may require Cn2 values between 200 and 500 pF.

I used "1/2 inch" (5/8 actual OD) PVC pipe as a form for both the driver plate tank (L1 - 28 turns close wound



100 watt output GCW for 75 meters

number 24) and the final RF choke (L2 - 55 turns close wound number 30). The final tank inductor is B&W 3055 miniductor, 1-1/2 inches diameter, 11 turns. Its inductance measures 5.5 microhenries. Any equivalent inductor you may have will suffice. When resonant at 7290 kHz and adjusted for full modulation peaks, my pi-network input and output capacitors measure 94 and 170 pF respectively. Since the output power level is adjusted primarily by the RF level control, the pi output capacitor can be a fixed mica unit rather than the mica trimmer shown in the photo. I have used a good quality mica trimmer as the input capacitor of the pi network in a similar GCW prototype at the 25 watt level, so this is a possibility if your junk box is bare of air variables.

Tuning up a new GCW is not complicated. First, remove B+ from the final screen and plate, and apply B+ to the RF oscillator and driver stages. With a nearby receiver, verify the oscillator operation with the RF level control at minimum. Then advance the RF level control and peak the RF drive tank circuit on the receiver S-meter. Return the RF drive to zero, and apply final screen and plate voltages. A milliammeter in the final plate B+ should show no current if the -150 volt bias supply and circuit are correct. Advance the RF drive to produce 20 to 50 mA plate current, and tune the final tank for maximum RF output as shown by a peak-reading RF output meter feeding a dummy load. Now re-peak the RF driver tank, and check in the receiver for spurious signals or squegging oscillation noises that indicate lack of neutralization. Try different settings of Cnl and/or different values for Cn2 until the final is properly neutralized, and stable amplification is obtained. Advance the RF drive level to obtain 15 to 25 watts unmodulated carrier output. Advance the AF level control, speak into the mic, and observe the peak modulated RF output power. Adjust the pi network output capacitor to obtain peaks of 4

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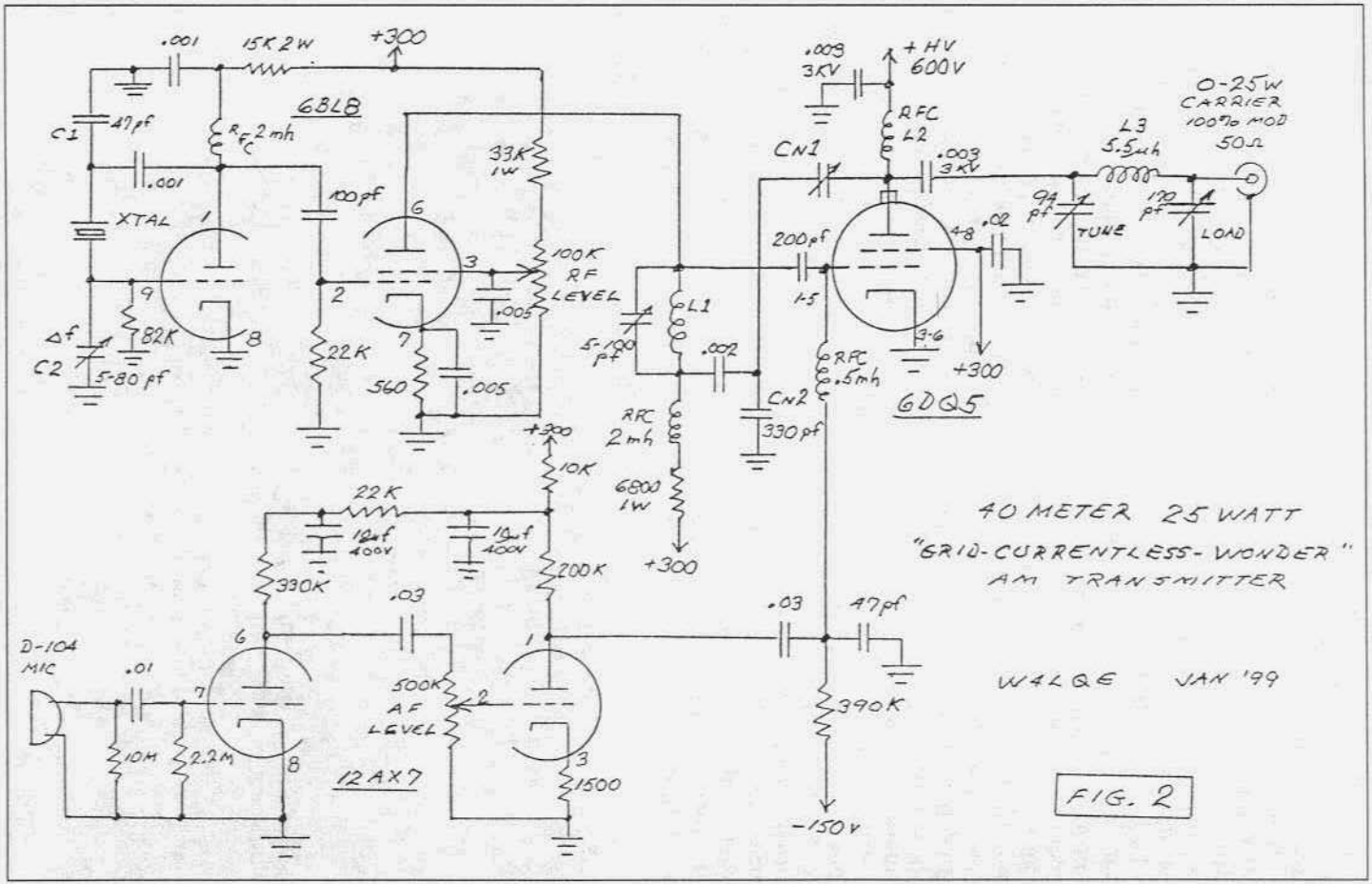
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15K 2W
+300
6BL8
C1
47pf
RFC 2 mh
.001
XTAL
100pf
33K 1W
100K RF LEVEL
.005
Δf
C2
5-80 pf
82K
22K
560
.005
+HV 600V
.003 3KV
RFC
L2
CN1
.003 3KV
L3 5.5μh
0-25W CARRIER 100% MOD 50Ω
94 pf TUNE
120 pf LOAD
200pf
.02
4-8
1-5
3-6
+300
6DQ5
5-100 pf
L1
.002
RFC .5mh
CN2
330pf
RFC 2 mh
6800 1W
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22K
10μf 400V
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330K
200K
.03
.03
47pf
390K
-150V
D-104 MIC
.01
10M
2.2M
500K AF LEVEL
12AX7
1500
40 METER 25 WATT
"GRID-CURRENTLESS-WONDER"
AM TRANSMITTER
W4LQE JAN '99
FIG. 2

times the carrier level. For a 6DQ5 final with 550 to 600 volts on the plate, you will find the peaks limiting at about 100 watts. At lower output levels, such as you might choose for driving a linear amplifier, take care to set the AF level so as to have peak output not exceeding four times the carrier level. The 6DQ5 plate current will be about 130 mA at the 25 watt output level, and correspondingly lower if lesser output is chosen. Once set up and neutralized, a plate milliammeter is no longer needed, since tuning is done with a peak-reading RF output meter.

The tube types used in the GCW can differ from those shown to some degree. My prototypes can interchangeably use 6BL8 or 6EA8 as the RF oscillator and driver. Other triode-pentodes such as 6AN8, 6CXB and similar will work. You can, if you prefer, use separate triode and pentode tubes for the RF oscillator and driver. A 6C4 and 6BA6 would work. The 12AX7 speech amp circuit would have to be redesigned if a 12AT7 is used. A 12AU7 will not have sufficient gain. I show a 6DQ5 final amp as probably the most reasonably priced ($10 or less) sweep tube showing up at hamfests and in dealer lists. The 6LQ6 is electrically better (30 watts plate dissipation compared to 20 watts for the 6DQ5), but it requires a novar socket and is quite scarce and pricey (above $40). An excellent GCW final tube is the Russian Svetlana EL-509/6KG6, priced at about $30, and fully available from Svetlana distributors. Svetlana also makes an excellent socket for this tube, which does not fit well into US sockets. The EL509 has 30 watts plate dissipation and a rugged structure. In a prototype similar to the one here described, I could obtain 35 watts fully modulated from a single EL509.

The GCW method can be applied easily to higher powered transmitters than the 25 to 35 watt rigs that use a single final tube. Paralleling additional final amp tubes is a practical way to increase power, but the rather high input capacity of sweep tubes (about 25 pF per tube) can cause poor L/C ratios in the RF driver tank circuit if you go beyond two or three tubes. Push-pull circuits can solve this problem. I have modified HT-40 transmitters (single 6DQ5) for GCW operation at 25 watts output, and HT-44 transmitters (parallel 6DQ5s) for 50 watts output. (Both of these rigs are at W4OWR.) I have a 100 watt carrier output (400 watt PEP) GCW on 75 meters using four 6DQ5s in push-pull-parallel. This rig is on a 6 by 10 inch chassis, including power supply, and is shown in the accompanying photo. Compare it in size to a B&W 5100 or DX-100. All of these GCW rigs just described used 550 to 600 volts final plate voltage. Recent experiments I have done using EL509 tubes indicate that plate voltages of up to 750 provide higher output power and better efficiency. Remember to be very careful when working with rigs using this very dangerous voltage, especially if you use open construction as shown in the illustrated prototype.

If you are really adventuresome and have deep pockets, try adding GCW audio to a 4CX800 tetrode. These modern tubes have sufficient perveance to provide high output without going positive in grid drive voltage. In fact, the Alpha 91B linear amp, with a pair of 4CX800s, uses the onset of grid current as an over-drive trip. Experimenting with such tetrodes must include careful grid and screen protection circuits, with great care to prevent spurious oscillations. Can you imagine a legal-limit AM rig with just a 12AX7 as the modulator?

I would be pleased to hear other GCWs on the air. My GCWs and the ones I have provided W4OWR are the only ones currently on the air. Look for us on 3885 and 7290, and let us hear your GCWs soon. **ER**

The SX-100 Precision Frequency Meter

by Chuck Teeters, W4MEW
841 Wimbledon Drive
Augusta, GA 30909

I thought the Hallicrafters SX-100 was a communication receiver until Jack Shannahan walked into my office at Fort Monmouth with his report from the ARRL September 1958 Frequency Measuring Test. He had measured W1AWs frequency on 80 meters to better than 7 parts per million with his SX-100, a two dial general coverage MF/HF receiver.

Only a 26 hertz error, I couldn't believe it. He said he used a graph and bandspread dial adapter to get accurate readings. After he left I checked the evening sign-in book for September 17th. I thought he might be kidding and used our lab standard, but Jack had not signed in.

As a class I Official Observer I had to measure W1AW at least twice a year during the scheduled ARRL qualifying runs. I thought I was reasonably good with an average accuracy of 13 parts per million using a General Radio substitution oscillator, a Telrad 100/10 kHz standard, a WECo 19C Audio oscillator, and EICO scope.

Jack was not a ham, but liked to listen, so he had bought the SX-100. He heard my coffee break talk about the four ARRL frequency measuring runs each year. He was interested when he found out anyone could enter. The ARRL would mail individual results to everyone who sent in measurements.

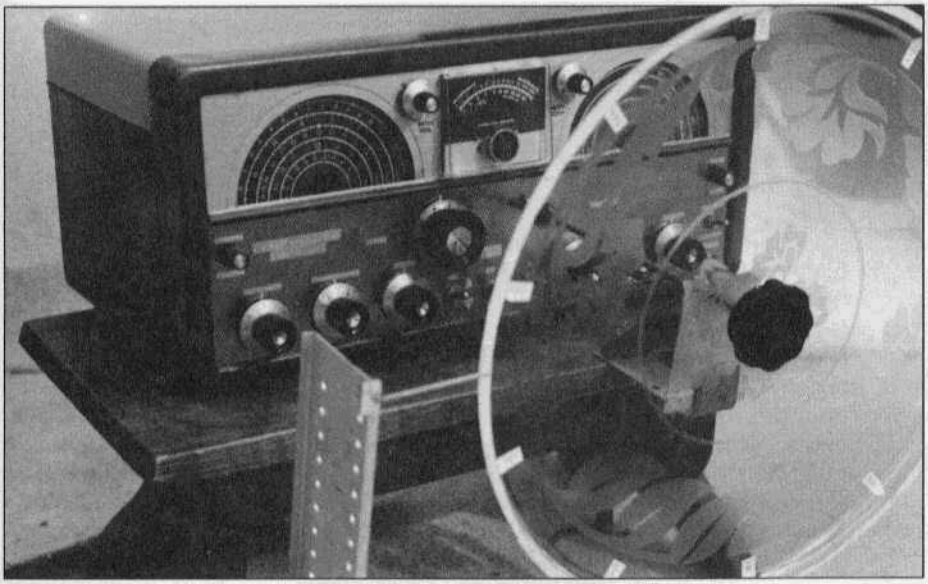
Jack never made any other measurements I knew of, and he never told me exactly how he did it other than with a bandspread dial adapter and graphs. We got separated by job changes in 1960 and other than occasional phone calls, I didn't catch up with him until it was to late, his funeral in Naples, Florida in 1993.

I never thought about Jack's frequency measurement until this year's Augusta Georgia hamfest. George, WB4NXG had an SX-100 for sale. Andy, WA4KCY had just given me $80 for a BC-348. George saw the money in my hand as I was looking at the -100 and said sold. So I brought the SX-100 home. I was going to do my best to find out if Jack really did it, or if it was just luck.

The SX-100 is a nice looking modernistic Hallicrafters, but inside it's a run of the mill double conversion superhet. The front end tunes just like any of the older single conversion Hallicrafters. The second conversion oscillator is crystal controlled and can run above or below the 1650 kHz first IF to provide sideband inversion, al la Mclaughlin. The second IF is 50 kHz and sharper than most older receivers with their 455 kHz IF. But a real AMer with a diode detector, tunable BFO, and carrier operated AVC.

The bandspread dial is calibrated every 20 kHz on 80 and can be checked every 100 kHz with the built in crystal calibrator. The bandspread tuning knob has a calibrated skirt with 100 divisions. To zero the crystal calibrator against WWV, I had to drop the voltage on the 6AU6 100 kHz xtal oscillator to get a good beat at 5 MHz. A 250K pot in the calibrator's screen and a 100 ohm pot in series with the receiver's antenna gave the necessary adjustment. S meter fluctuations allowed an exact zero beat and it would hold zero for almost a minute.

A bent coat hanger gave me a rear sight to eliminate parallax while running an 80 meter calibration check on the bandspread skirt tuning. 480 divisions between 3.5 and 3.6 MHz, 415 between 3.6 and 3.7, 350 between 3.7 and 2.8, and then reversing and increasing going on to 4.0 MHz. A graph from 3.5 to 3.7 shows 220 to 280 Hz per division and reasonably linear. Right respectful for the old Hallicrafters. I logged everything by coming at the readings counterclockwise to eliminate backlash, even though there wasn't much.



The author's 'Rube Goldburg' setup consists of an 18" dial (a plastic serving tray) and a 9" extension shaft.

Now if I could get a dial on the bandspread tuning that I could read 10 times better I would be in the ball park. A National velvet vernier 5 to 1 helped. I tried two of them in tandem but couldn't get the drag right between the two. An easier way seemed to be a bigger dial. I bought an 18 inch plastic serving tray and mounted it on the back of a 3 inch skirted knob. I marked out 1000 divisions around the edge by pasting blow ups of a protractor scale to the outer edge. To get the big dial clear of the front panel controls I used a 9-inch extension shaft and a Rube Goldburg Company Delux (Pat Pending) shaft support to hold things steady. The photo shows the details of the half vast engineering project.

The first thing I did with the large dial was check repeatability. I could hit zero beat within 2 divisions each time. That is resetting within 50 Hz, not bad. I ran a new calibration curve between 3.5 and 3.7 MHz with the big dial. Now my graph said I could read the dial to 25 Hz but the big question, how accurate was the dial and calibration curve?

I ran tests with my HP-5245 counter. I could easily get readings within 250 Hz of the counter readout with the dial and calibration chart. At the low end around 3.510 MHz where the W1AW frequency runs were held, the dial was really good. I could read it to 100 Hz or so. With no breeze blowing across the warmed up, calibrated SX-100, I could get a frequency measurement within 25 parts per million on the low end of 80.

Not as good as Jack got 40 years ago, but a lot closer than I thought was possible. So either Jack knew something I don't or it was 2 parts per million ingenuity and 4 parts luck. Anybody got any better ideas on how he did it? Back in the fifties when I was at Jack's home I never saw anything more than a Simpson 260. He wasn't into do it yourself, and he didn't have a radio junk box. Jack was penurious so it would have to have been a low budget operation. In the meantime 'til somebody comes up with a better suggestion I've put the regular bandspread knob back to convert the SX-100 precision frequency meter into the SWL/ham receiver it originally was. ER

The First CCA National Convention

by George Maier, K1GXT
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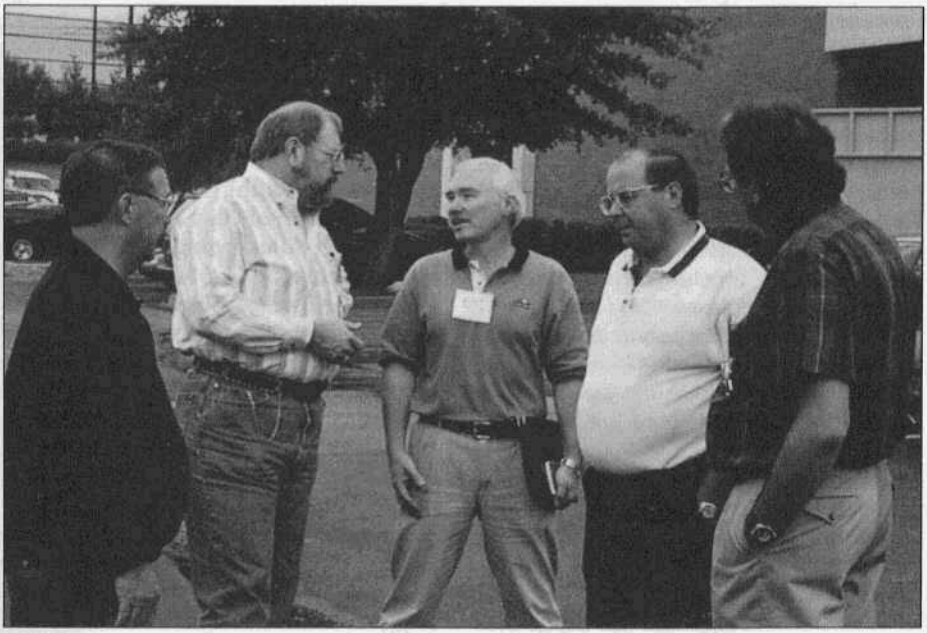
Last October, Jay Miller, KK5IM and the Dallas Posse put on a show for the CCA that can only be described as outstanding. The CCA has been meeting in one way or another since Bill Wheeler, KØDEW, first called the 20M net together in 1989. Initially, 20M was the only meeting place, but at the 1991 Dayton Hamvention, the first eyeball meeting took place, starting a tradition that has grown in popularity ever since.

Thanks to Rockwell-Collins, the CCA has also had several top notch get-togethers in Cedar Rapids, complete with tours of the Collins facility there. The Dallas event however, was the first time that the group hosted a true national convention with invitations sent far and wide. And come they did. Twenty-four states were represented, and three attendees from Europe came as well.

From the opening reception on Thursday evening, October 15th, to the final adjournment on Sunday morning after breakfast, attendees were constantly entertained by a well-orchestrated series of lectures and events aimed at informing them about their beloved Collins radios, and at having a good time in the process.

Imagine what ran through WA5VVT's



Some of the convention attendees, left to right: J.B. Jenkins, W5EU; Jay Miller, KK5IM; George Maier, K1GXT; Jim Stitzinger, WA3CEX and Maury Guzick, W5BGP. ***Photo by Gary Halverson, WA9MZU.***

John Bess, WA5VVT, explaining a restoration technique. ***Photo by Gene Duprey, K1GD.***

(John Bess) mind as he gave a lecture on aligning the S-Line dial mechanism, while Fred Johnson, the Collins engineer that designed it, looked on..... a little pressure, John !!! Same thing for Steve Pautard, WN4I, who gave a great talk on rebuilding the 30L-1 power supply, while Warren Bruene, W5OLY, lurked in the background. Warren was involved in developing many of the Collins transmitters and amplifiers....more pressure. Seriously, the support that former and present Collins employees have given the CCA is a great testament to the group itself, and their dedication to keeping the good name of Arthur Collins in their memories, and in ours.

Other lecturers included Warren Bruene, W5OLY; Jim Stitzinger, WA3CEX; J.B. Jenkins, W5EU; Butch Schartau, KØBS; Bud Whitney, K7RMT; Mac McCullough, W5HPM on a wide range of subjects from prewar Collins equipment to how to wire your shack (to not melt down with all those amps flowing in !!). The prewar Collins presentation was given by J.B. Jenkins, W5EU, and it included an excellent overview of Art Collins in the early days, by Gary Halverson, WA9MZU. Hands on alignment and operating tricks were anther phase of the program.

From time to time, one or two special event stations got on the air from the convention site. The call WØCXX was operated from the restored Collins communication van of Jim Stitzinger, WA3CEX, while W5ROK was operated from the Mobile Communications Center of the Dallas Amateur Radio Club. The Collins van had an S-Line and a KWM-2 on line, while the Mobile Communications Center sported a KWM-380.

Saturday afternoon was candy time. The troops toured the Rockwell Collins - Government Systems facility in Richardson, as well as some very impressive Collins equipment collections owned by Jay Miller, KK5IM, J.B. Jenkins, W5EU, and Jenks Garrett,

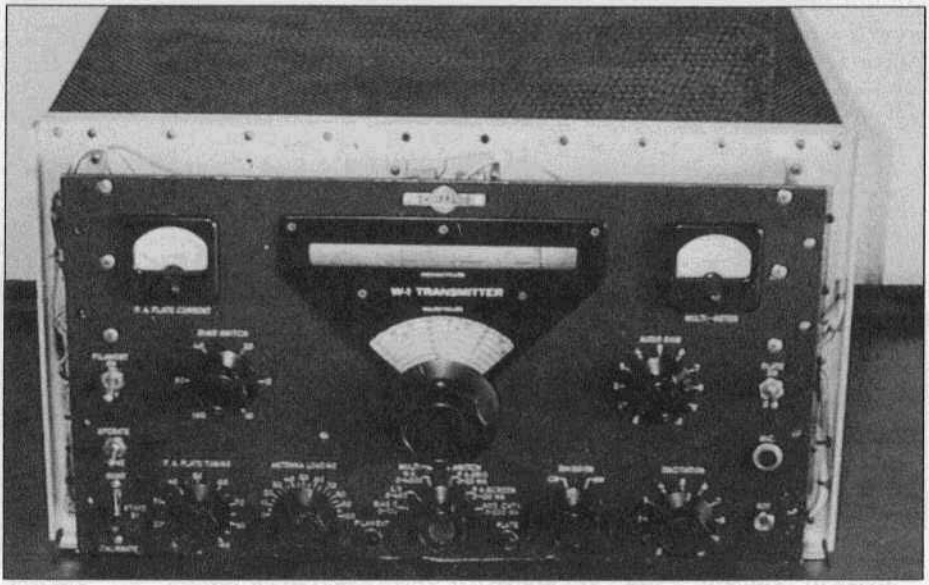
continued next page

K5YNZ. Jenks was kind enough to have a super Texas style barbecue Saturday evening at his Radio Ranch for the hungry conventioneers, and boy was it tasty.

The new CCA board of directors, including: John Bess, WA5VVT, Floyd Soo, W8RO, Jim Stitzinger, WA3CEX, and Butch Schartau, KØBS, led by CCA President Sandy Meltzer, KW6KW, are definitely going to have their hands full trying to follow up this event for 1999.

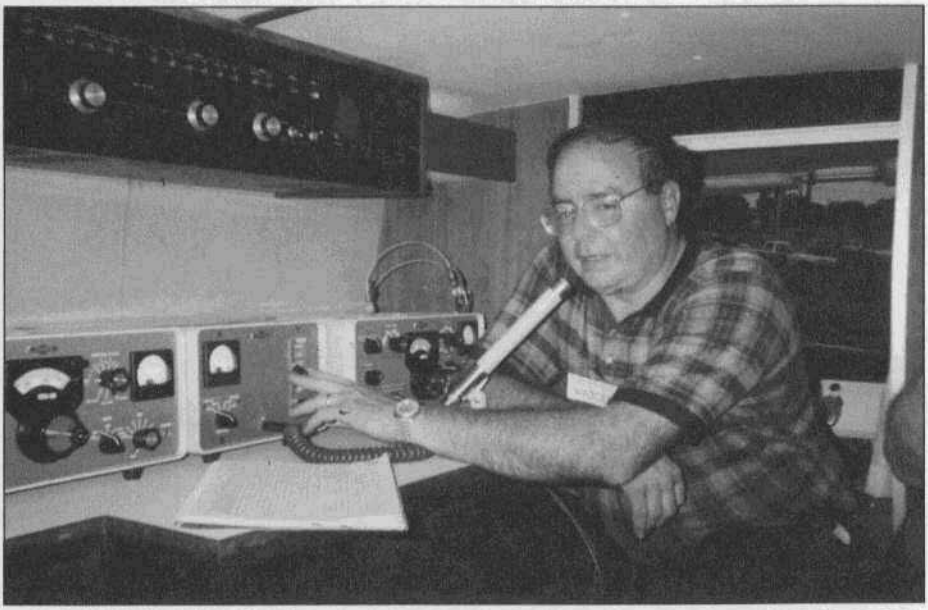
The next official meeting is at the Dayton Hamvention. For details on Dayton, how to join the CCA, or get on the Collins e-mail reflector, check out the CCA web site at: http://www.collinsradio.org. ER

On display at the convention, left, Jay Miller's, KK5IM, SC-310 Heath to Collins spectrum scope conversion and on the right Butch Schartau's, KØBS, antenna tuner built in a Collins case. *Photo by Gene Duprey, K1GD.*



The 30L-1 prototype owned by J.B. Jenkins, W5EU. *Photo by Gary Halverson, WA9MZU.*

The Collins Radio Company Communications Van that has been completely restored by its owner Jim Stitzinger, WA3CEX. This van was used by Collins to demonstrate its Amateur Radio equipment around the country. *Photo by Gary Halverson, WA9MZU.*

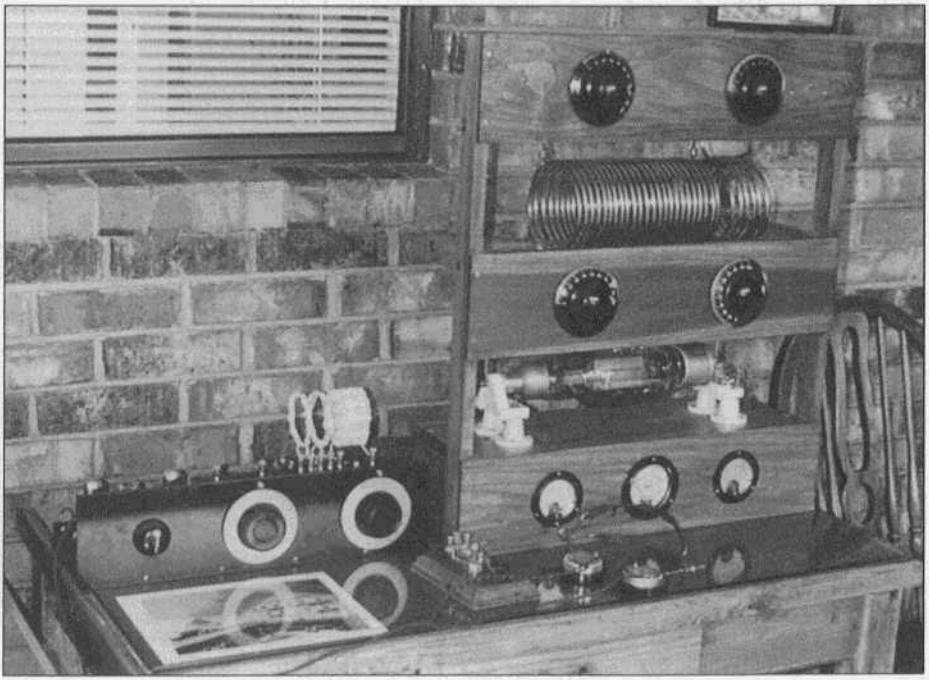


Jim Stitzinger, WA3CEX, operating special event station WØCXX at the CCA convention from inside his restored Collins van. *Photo by George Maier, K1GXT.*

more photos next page

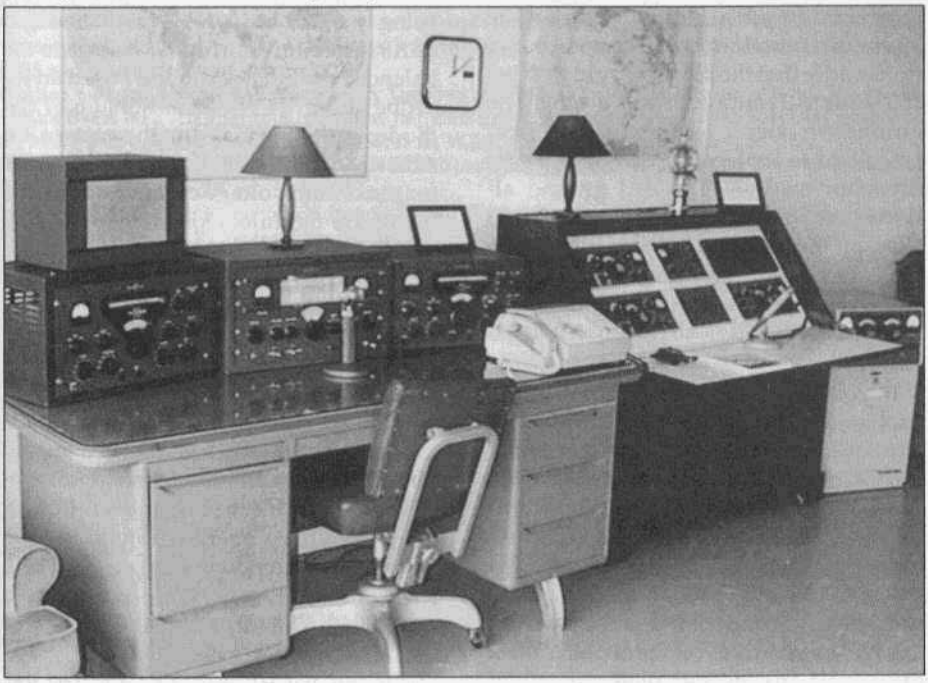
Saturday afternoon included a tour of J.B. Jenkins', W5EU collection

J.B. Jenkins, W5EU, left, Gary Halverson, WA9MZU, right, with W5EU's Collins 30J transmitter. *Photo by W5EU.*



J.B's replica of Art Collins' 1926 station. *Photo by Gary Halverson, WA9MZU.*

J.B's pre-war room. *Photo by Gary Halverson, WA9MZU.*



J.B. Jenkins' garage. *Photo by Gary Halverson, WA9MZU.*

Tips on Restoring the Central Electronics 100V

by Victor L. Gregowski, WD8DWR
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Tip #1

The modification in Charlie Talbott's K3ICH[1] article that involved installing a 1 uf@200 VDC capacitor between V7A pin 1 and the PS-2 phase shift network is not a bad idea. However I recommend that the capacitor voltage should be at least 400 VDC. I found that the voltage on pin 1 of V7A rises to at least 300 VDC on turn on. My power supplies are all solid state. I included a 100-ohm resistor in series with each diode when I built my plug-in replacements.

Tip #2

If you experience intermittent audio problems in the SSB generator the problem could be a bad ground wire on the audio filter module jack. I found on my transmitter that the power would go from 100 watts to 0 watts with no warning. The ground wire ties to terminal 4 of the jack. I also had to replace the cathode bypass capacitor on V6B. The bad ground allowed the voltage to rise to at least 150 VDC on the case of the audio filter module causing the capacitor to short. I replaced the capacitor with a ceramic disc rated at 500 VDC.

Tip #3

If you experience intermittent audio problems in the SSB generator the problem could be in the PS-2 phase shift module. On my unit the power would go from 100 watts to about 5 watts with no warning. It acted like the problem in tip #2 except the power never went to zero. The micas C-128 and C-130 in the PS-2 were beginning to conduct DC and they were applying a positive voltage on the control grids of V8 causing both plate voltages of V8 to drop to 4 volts. I rebuilt the PS-2 unit and the problem went away. Hopefully you won't have both intermittent problems in the SSB generator at the same time. I wasn't so lucky. If you don't want to tackle rebuilding the PS-2 then install a 1 uf at 400 VDC capacitor between pin 1 of V7A and the PS-2 terminals 2 and 6. That modification[1] should take care of the problem.

Tip #4

In the diode module there are 4 diodes that are used in the balanced modulator. I found that the diodes were a little leaky so I decided to change them. The schematic showed them to be MQ4-024's but they were CK715's. ECG semiconductor replacement manual recommends using ECG-109. They work just fine in the SSB generator.

Tip #5

The 8 MHz oscillator is another area that needs to be addressed. The manual and the pictorial of the tube layout diagram shows using a 6U8 for V11. However the chassis and the schematic show using a 6EA8 for V11! I found using a 6EA8 for V11 gives a higher voltage to the balanced modulator diodes. I used an RF probe and a VTVM at terminal 6 of the diode module to measure the voltage. Be sure to adjust the V11 plate transformer for maximum voltage on pin 6 or pin 7 of the diode module. Doing this will give you the best possible suppression of the unwanted side band. Just a last note about the voltage on the diodes as they may not be the same. The voltage is determined by the tuning of the 8 MHz RF phase shift coils. As either coil is tuned the voltage applied on pins 6 and 7 will change. I found that as the voltage on pin 6 raised, pin 7 lowered and vice versa.

The Central Electronics transmitter is a real pleasure to operate. I hope to hear yours on the air soon! **EB**

References:

(1) Charlie Talbott, K3ICH, Electric Radio, # 88, August, 1996
(2) Dennis Petrich, KØEOO, Electric Radio, #30, October, 1991

VINTAGE NETS

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCI. 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 14.165 at 1900Z and 3760 at 2000Z. Net control is Dave, VA3ORP.
Beer Town Traders Net: On 3885, 5:30 Central Daylight Time on Saturdays.
Westcoast 40M AM Net: Sunday afternoons from 3-4 PM westcoast local time until 4-5 PM on 7160 +or- QRM.

Nets that are underlined are new or have changed times or frequency since the last issue.

The 'EHA* Shortwave Receiver

...the best laid plans, etc.

by Bruce Vaughan, NR5Q
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I live some 85 miles from Joplin, Missouri. Hams from this area leave very early in the morning to attend the annual Joplin Hamfest—otherwise, all the 'good stuff' will likely be gone when you arrive. This past spring our group timed our arrival perfectly—the doors opened as we stepped from my old Lincoln. After paying a small admittance fee I hurried inside to buy some things I desperately needed. Inside the convention center were dozens of tables stocked with 'good stuff'—junk that other hams are hoping to unload before the day ends. I was looking for a chassis, cabinet, power transformer, and other parts needed to build a bandswitching regenerative receiver—one that would hopefully surpass the "CW Special" written up in this magazine last summer.

I soon spotted my treasure sitting on an unattended table—a General Electric Sweep Generator. It appeared in excellent mechanical condition, and as I intended to junk it out for parts electrical operation of the unit was unimportant. The two National vernier dials were smooth as silk—though experience indicated they needed a modest amount of cleaning and lubrication to feel new again.

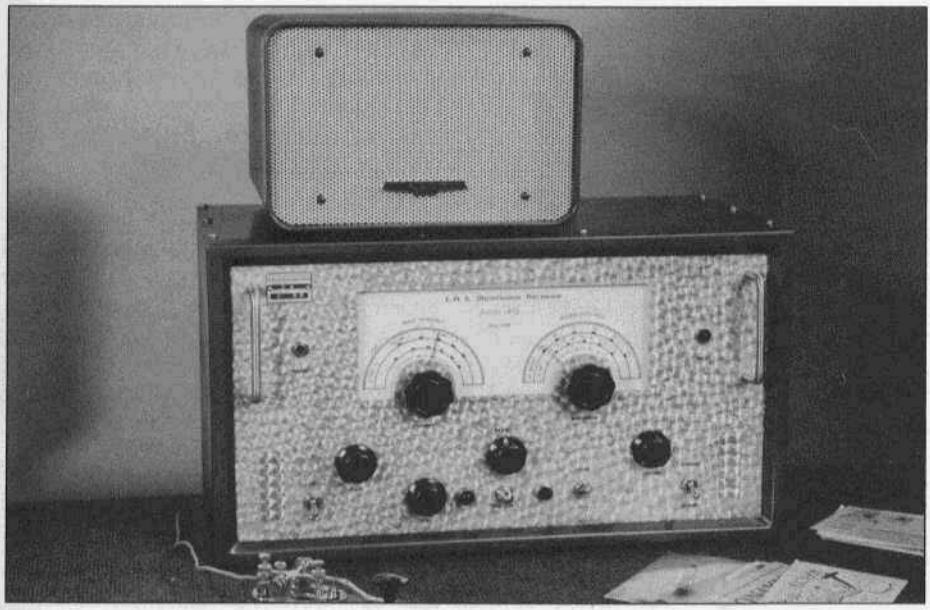
The price was plainly marked on the heavy cabinet—$15.00. To me, it was worth that much—and more. I found a scrap of paper and a 'magic marker' on the table. Quickly I printed SOLD in big letters on the wrinkled paper and signed my name and call in the corner, then attached the paper to the front of the generator with masking tape. I was sure the owner would honor my purchase when he returned.

After a quick lap around the large hall I dropped by to see if 'my' bargain was still there—it was, and now the owner was behind the table. I paid for the G.E. generator and carried it to my car. After loading the heavy item I thought to myself, "This unit is built well enough to withstand use on a battleship." It seemed I had made my purchase for the day; I could find nothing else of interest. I was so thrilled with the generator that perhaps my thought process was dulled.

The following Monday morning I started disassembly of the unit. My enthusiasm mounted with the removal of each screw. What a find! The power transformer was husky enough to power any receiver I was likely to build—it appeared to be capable of about 100 mA continuous duty.

Perhaps I can describe the foundation well enough for you to understand my excitement. The cabinet has a removable top, is made of heavy steel, and the size is perfect for my needs. It is a standard 19 inches wide, 11 inches high, and about 10 inches deep. There is a cutout in the center of the chassis about 6" by 8". In this hole sat a double-shielded box. Actually two boxes separated by about 1/2 inch. Now that's shielding!

The panel of the generator is 1/8 steel covered with a lightweight matching panel made of aluminum. I hoped I could use all the holes and not have to drill many new ones. I had to use the double panel, the aluminum panel holds



E.H.A. Shortwave Receiver ready to operate.

the Plexiglas cover over the two National dials.

The first of many problems now reared its ugly head. The lettering on the instrument panel was stamped into the soft aluminum. After sanding the panel with an electric sander the lettering was still plainly readable. I flipped the panel over—it was only faintly visible on the reverse side. Lucky for me the panel was laid out symmetrically. If the lettering impressions could be removed by lightly sanding there was no reason why I could not flip the panel. A test showed the best way to remove the lettering indentations was by using a 'circular pattern' effect. This problem solved, I returned to construction details. See end of article for instructions on doing the poor man's 'engine turning.'***

Boy, oh boy, a double shielded detector should be the very thing. I decided to build the set to cover 15, 20, 40, and 80. I did not expect too much from the receiver on 15 meters. That is about the break-point for a regen. Even the old timers knew super regeneration was needed on frequencies higher than 20 MHz.

This latest receiver—the fourth regenerative built in 1998—uses approximately the same circuits as the previous two dozen or so receivers. I'm sure some readers are saying, "Here we go again. Why would anyone with an IQ higher than a turnip keep building the same circuit over and over again? This 'ol boy's gotta have big problems."

I am the first to agree that it would seem that way. Bear with me for a few lines and perhaps I can explain. I dare anyone to build two receivers, using the identical schematic, that work exactly the same. It was theoretically possible to do so years ago when you could order every part needed from good old Allied Radio, or other well stocked supply houses. Today, it just don't work that way. The differences in receivers is greatly increased when it becomes necessary to build with used parts. Parts with similar electrical characteristics may vary greatly in physical size and

continued next page

shape. Every time you change the physical layout, lead length, and lead dress change. In receivers, the difference in operation can be astounding.

If we change circuits, voltages, and the physical layout every time we build a new receiver it is difficult to 'improve the breed.' When building from scratch, every receiver is a prototype. The prototype can be improved upon only by making small changes while sticking with the same basic design. When you feel a circuit is delivering peak performance it then becomes necessary to seek a design that is different--hopefully better--and start the process all over again. Remember the HRO, the Super Pro, and the Sky Riders--they each went through many improvements but retained a basic design.

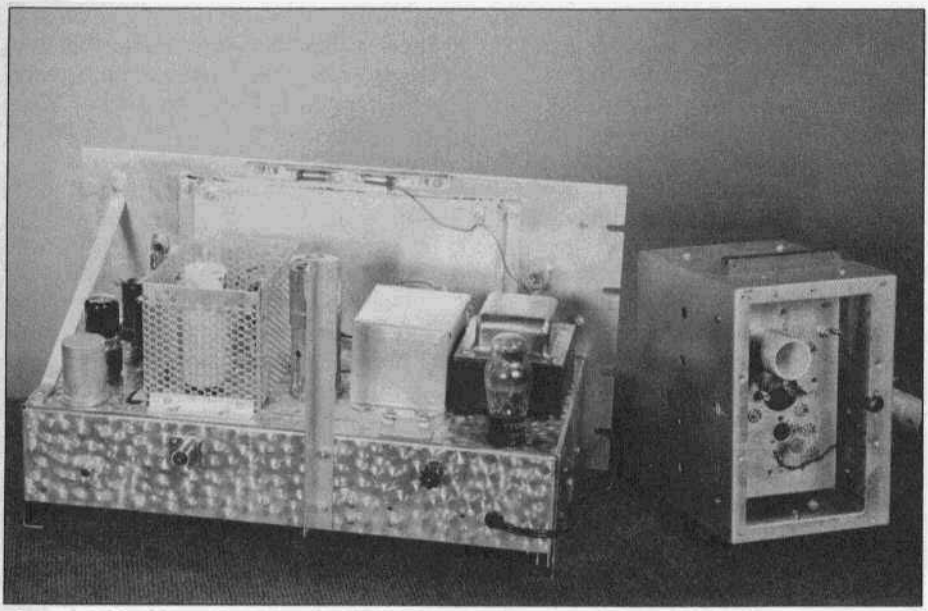
I have many receivers that operate moderately well. At this writing I have about five that I consider above average—and I have some real dogs. Some have worked so poorly they were recycled. Here's the strange thing—the circuits are practically identical, the voltages are close, and many times I use the same plug-in coils. Why the big difference? Mechanical design and layout is the answer. How close am I getting to the circuits apogee—the maximum the circuit is capable of? I will know when I build two or three in a row that show no improvement. Then I will start trying to find a better circuit.

For convenience and clarity a schematic of the detector stage is shown. The audio stages are conventional in every respect. This receiver uses a 6SQ7, 6SQ7, 6V6 output. Resistance coupling is used because a/- it works extremely well, and b/- transformers are becoming rare and expensive. As usual, I run my audio preamp stages at less than maximum output because I have found most audio problems occur when running tubes 'flat out.'

Perhaps this is a good place to talk voltages. Any power supply that furnishes from 175 to 350 volts should be OK. The important thing is not so much the supply voltage, but the voltages on your tubes. This is easy to adjust by juggling resistances. For example the voltage between R-4 and R2 should measure about 90-95 volts—if it does not change the values of R-4 and/or R-5. R-2 is a 60K, 1 watt, pot. It is adjustable from the front panel—notice the 'acorn' nut, center panel, near bottom. When the acorn nut is removed the screwdriver adjustment is accessible. This pot is for 'fine tuning' the plate voltage so that really smoooooooth regeneration is attained.

Back to the project at hand. My sweep generator chassis and cabinet seemed to lend itself very well to a four-band, bandswitching receiver. Coils for 15, 20, 40, and 80 meters were wound on 3/4" and 1" PVC stock.** I matched the coils with capacitors that appeared to be suitable, then checked my work with both a Millen and Kenwood dipper. Everything seemed in order. I followed all the building rules as best I could, such as keeping coils well separated or at 90 degrees to its closest neighbor. The bandswitch was located with lead length in mind—and while not perfect, it looked good to me. One thing troubled me—the lead to the regeneration control was over six inches long. However, I see no way that a long lead here could present a major problem. I shielded everything as best I could—using shielded wire in much of the audio circuit in an effort to reduce hum.

The day arrived for my initial test of the latest 'E.H.A. Shortwave Receiver.' I powered up the set and checked my plate supply—it was close enough--about 275 volts on the 6V6 plate. Having passed the 'smoke' test, it was time to apply my scientific 'wet finger to the volume control center tap' test. I was rewarded with a nice loud hum—the audio was working! What the heck, that only leaves the detector—the set had to



The troublesome double-shielded cage is shown to the side of the completed receiver.

work. I carried it from my workbench over to a table where I had access to a good antenna.

When a random length wire antenna was attached to the little jewel I was greeted by some of the most ear shattering, ego deflating, irritating noises you ever heard. Back to the workbench. The detector was checked and rechecked—everything was in order. More screeching and howling. Oh, I could tune in stations, not many, not very well, and certainly nothing like I expected. Time goes by—I will spare you the details of the next two weeks. With antenna connected my tests were always the same--disappointing.

Out came the coils, out came the bandswitch, out came the whole beautiful double shielded cage. Most of the wiring also came out. I used up two rolls of 'solder wick.'

A complete rebuilding seemed to be in order. Forget 80 meters—it's too darn noisy here anyway. Forget 15 meters, regen detectors fall off sharply up there. OK, I'm back to my two favorite bands 20 and 40 meter CW.

Obviously, the double shielded can in the center of the chassis was not such a great idea for a receiver. I had become so engrossed with shielding that I made too many compromises in design. Shielding is all important, but it should not take precedent over a well designed parts layout.

A search of my scrap aluminum stock revealed a piece large enough to cover the big hole in the center of the chassis—and a few surrounding holes as well. OK, so I don't have a double shielded detector, I'm darn sure going to have a double thickness chassis—at least in places.

This time around the parts were laid out with one thing in mind—short leads. Short leads between the antenna and trimmer, between the detector tube and coil, between the volume control and first audio, between detector and regeneration control, and leads going to the tuning capacitors.

continued next page

I thought I could still employ bandswitching. Why not use a DTTP DC relay? It seems reasonable to assume that one would have less chance of the detector picking up hum by induction is the relay is operated by DC. I found a DTTP, 12 volt relay in my junk box. This relay should be ideal, I could power it with a little power cube from Radio Shack.

I mounted one plug in coil, band 'A', on top of the chassis and cut down one of my heavy aluminum cages to a size just large enough to shield the coil, tube, and tuning capacitor. Under the chassis, mounted to the relay itself, is another coil, band 'B'. Simply by throwing a toggle switch on the front panel I can change from band 'A' to band 'B'—whatever I choose. As band is a plug in coil, I have the option of choosing whatever two bands I want the receiver to cover. Such 'trailing edge' technology in a receiver is something any 1928 ham would have been proud to own.

As my experience with this particular receiver had been disappointing so far, I decided the wise thing to do was wire up the 'plug-in' coil only, get the set operating at a satisfactory level, then tinker with the odd-ball bandswitch. The results were actually unbelievable. This receiver really outperformed all my other homebuilts by quite a margin. Can a receiver work too well? In this case the answer may very well be yes. It worked so good I was reluctant to finish up the bandswitch.

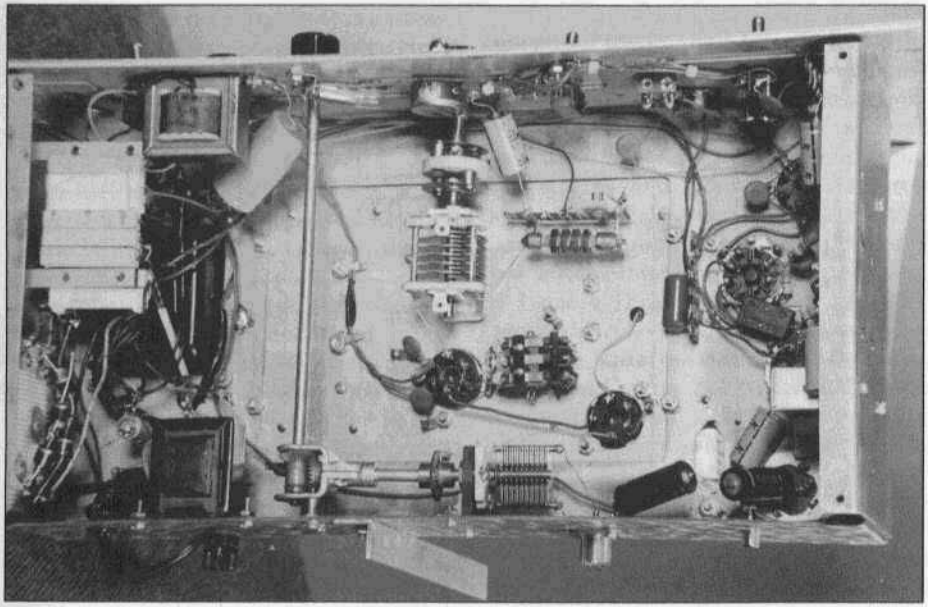
Though the G.E. sweep generator was a great foundation for a receiver, there remained a number of problems to overcome. For one thing G.E. did not provide any lighting for the dials. I suppose they assumed it would be used on a well lighted workbench, and such frills were not worth the extra cost. I removed a bracket directly above the Plexiglas that covered the National dials. Two bayonet pilot bulb bases (Radio Shack) were mounted to the bracket and the #47 bulbs adjusted to edge light the dial cover. When I turn the receiver on now, the dials are bright and easy to read. As a matter of fact, I am thinking of adding a dimmer control to the circuit. By the way, pilot bulbs cost real money today, so it is a good idea to put a 10 ohm resistor in series with the bulbs to cut down on the voltage slightly. This will result in a greatly increased bulb life.

The cabinet was not beat up in any way but was badly scratched. I sanded it smooth, primed it, then more sanding, and finished up with two coats of a dark blue hammartone paint. Hammartone paint in spray cans is available at most home centers. I bought my paint at Lowes. An old Heath speaker was given the same treatment to match the receiver.

As the chassis was somewhat tarnished and pitted I used more circular patterns to brighten up the set—give it the old 'Spirit of St. Louis' touch. This finish also helped cover up my tracks where I added the chassis cover.

Oh yes, I almost forgot. It was necessary to cover up some holes on each side of the front panel. You can see the 'dirty work' if you look carefully. I simply glued two very lightweight pieces of aluminum over the holes. The 'engine turning' on the two covers are slightly different from that of the panel—otherwise they would not be obvious.

Suppose I have the receiver set up with a 20 meter coil in the 'A' position, and my 'B' coil is wound for forty meters. If I decide that I would like to work another band it will involve changing the 'A' coil. While I could do so I did not like the idea of pulling the set forward and feeling around inside the cabinet trying to find the coil socket. I took the hassle out of the problem by cutting a hole in the top of the cabinet directly over the coil socket. Wood dowels were turned to just fit inside the coils. I attached my coils to the dowels with small



Underside of chassis shows DTTP relay in place ready for wiring. Forty meter coil made from B&W stock is attached directly to relay contacts.

brass screws--then center drilled the wood turning with a 1/4' hole about 1" deep. A short piece of old volume control shaft was glued inside the hole--allowing enough sticking out the top to which I attached a large radio knob. The knob gives me a good grip on the coil and looks OK—just the knob shows above the cabinet top. Call it haywire, call it butchery, call it poor workmanship, call it anything you like--it works, it's simple, it's cheap, it's easy, and above all it is trouble free.

The dial scales on the generator were silk-screened onto a nice heavy piece of aluminum. I used pieces cut from white gummed labels to cover all unwanted numbers. Then I took the dial scale to a local copy shop and had them do a few copies gradually increasing the contrast until the paste up became visible. I used the highest contrast that was good and clean with no tracks of my cover-up showing.

The original scale was covered with my clean copy—it was attached at the corners only using a discount store glue stick. One must have a little patience here. The set had to be assembled completely with one exception—no Plexiglas cover over the dial scales. When the set was working properly, I calibrated it against my Kenwood TS-930. Markings on the scale were made with a sharp pointed felt tip pen. When fully calibrated, the front cover was removed and my 'work sheet' dial scale removed. This was placed under a fresh dial scale, placed on a sheet of glass with a light underneath, and rub-on numbers applied at the proper places.

The EHA Shortwave Receiver logo was made on my computer, cut out, and glued on the dial scale. When all work was complete it was again copied until a perfect specimen was obtained. How did I attach the paper scale to the original metal scale without danger of yellowing due to a chemical reaction from the glue? I made a trip to our local museum and talked to the young lady in charge of preservation of paper docu-

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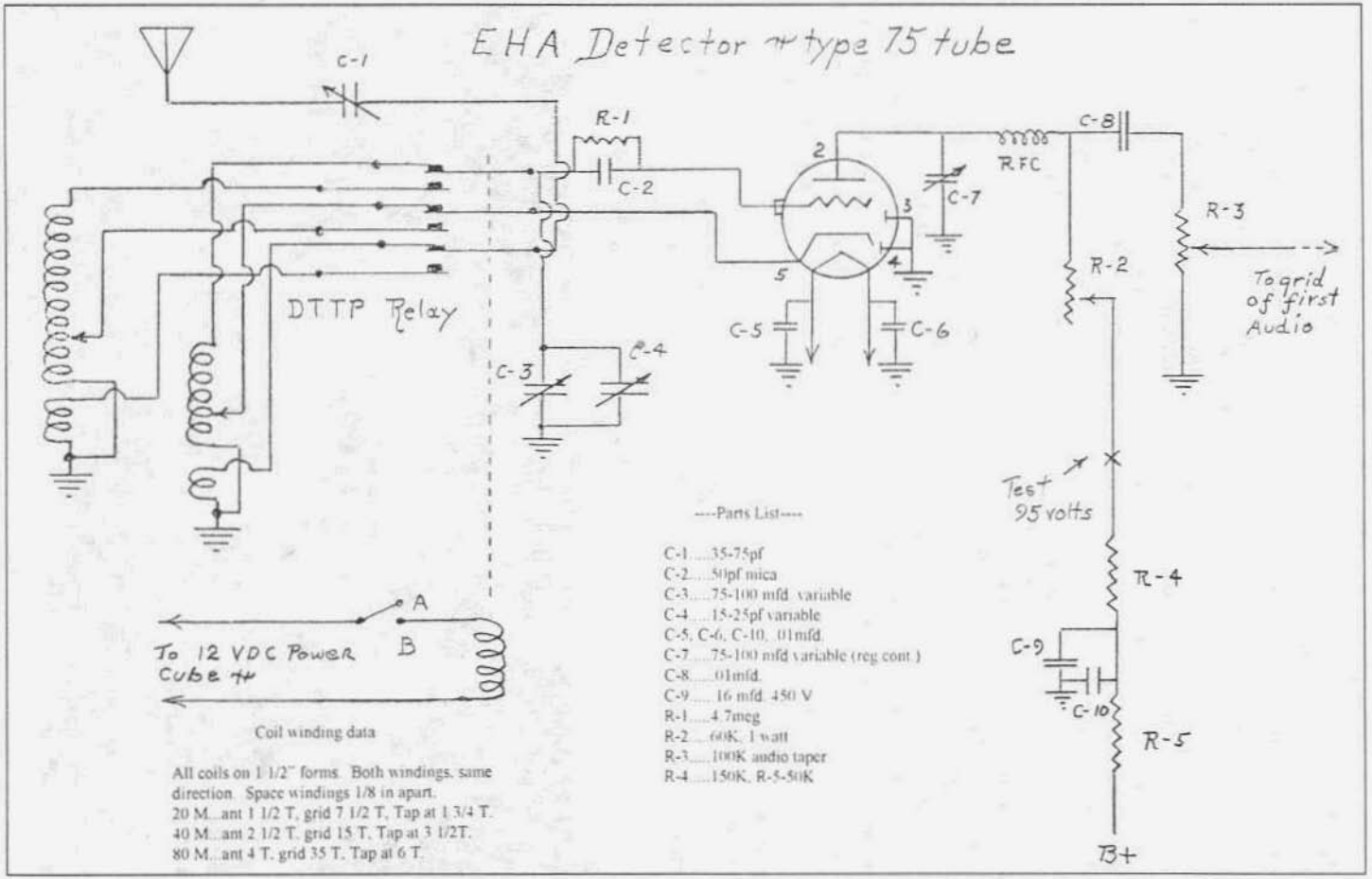
EHA Detector ++ type 75 tube
C-1
R-1
C-2
DTTP Relay
C-3
C-4
2
3
4
5
C-5
C-6
C-7
R.F.C.
C-8
R-2
R-3
To grid of first Audio
Test 95 volts
R-4
C-9
C-10
R-5
B+
A
B
To 12 VDC Power Cube ++
----Parts List----
C-1.....35-75pf
C-2.....50pf mica
C-3.....75-100 mfd. variable
C-4.....15-25pf variable
C-5, C-6, C-10, .01mfd.
C-7.....75-100 mfd variable (reg cont.)
C-8.....01mfd.
C-9..... 16 mfd. 450 V
R-1.....4.7meg
R-2.....60K, 1 watt
R-3.....100K audio taper
R-4.....150K, R-5-50K
Coil winding data
All coils on 1 1/2" forms. Both windings, same direction. Space windings 1/8 in apart.
20 M...ant 1 1/2 T, grid 7 1/2 T, Tap at 1 3/4 T.
40 M...ant 2 1/2 T, grid 15 T, Tap at 3 1/2T.
80 M...ant 4 T, grid 35 T, Tap at 6 T.

ments. She had the answer. It is a preservation type of pressure sensitive glue sheet. I do not know if it is available in small quantities but I'm sure a small donation to your local museum will get you a piece of the material. You might even luck out and get someone with experience in such things to do the work. I did, and she turned out a really great job.

You may notice that a voltage regulator tube is in place but not wired in the circuit. I may eventually wire it up to the plate supply of the detector tube, but in all honesty I must say that so far this receiver has proven to be very stable—as regenerative receivers go. Drift is measured at about .45 Khz—less than one half Khz—for the first thirty minutes of operation, allowing a three minute warm up. I could not ask for much better.

This receiver is still undergoing more than a little 'tweaking' but presently is the best one I've built. I have it sitting beside my mint Corsair II on my operating desk. As expected the Corsair II beats the socks off it as far as selectivity goes—and why shouldn't it? The Corsair is loaded with filters and recently aligned by TenTec. However, in test after test, any signal that I can hear on the Corsair, I can hear on the regen. That's pretty darn good for technology 60 years old. ER

*Edwin Howard Armstrong—Inventor of the regenerative circuit.

** Coil data should be considered as a starting point. Due to the variables encountered in construction, operation of your set may be improved by 'tweaking' the coils. This is especially true with the position of the regeneration tap. If the tap is too low on the coil, the set may not go into regeneration at all. If it is too high, the regeneration may be 'rough.' When the tap is placed correctly, regeneration will be silky smooth.

***A number of readers have asked me about the method I use to make the circular pattern effect I use on many home built projects. There is a right way to do this, and then there is a 'cheap and dirty' way. As my workshop facilities are very limited I use the latter method. A drill press is needed if you are to do a good job. You will have to ask a machinist how to do it properly.

I use a short length of a 1/2 inch wood dowel—about 5 inches long. Cut the ends square—avoid a cut that is on an angle. Cut four or five strips of fine sand paper about 1/2 inch wide by four inches long. Drape a piece of paper over one end of the dowel. At 90 degrees to the previous paper, drape the remaining pieces of sand paper. Pull the paper snug around the end of the dowel and tape in place with electrical tape. Chuck the dowel in your drill press and with press running at normal speed, lightly feed the spinning sandpaper against your chassis or panel. Avoid coarse sandpaper, heavy pressure, and replace the sandpaper when worn.

A finish like this is easy to overdo—like Louisiana hot sauce, a little goes a long way. Then why do I use it so often? Because when working pitted, scratched and corroded panels and chassis pans it is the fastest and neatest way to make them look presentable. While not impossible, a pleasing effect is difficult to achieve when using a hand held electric drill—the drill has a tendency to 'walk' all over the place.

Note from the author:

The preceeding article contains nothing new or startling. As one reader politely reminded me, I am not a R.E., E.E., or Ph.D. I am just an oldtimer who loves to experiment with circuits I grew up with. For those who enjoy building, I hope you found a few worthwhile tips and ideas that will help you enjoy your hobby a little more... the best laid plans, etc.

Plant Culture With High Tension Current

Reprinted from the book "High Frequency Appartus" by Thomas Stanley Curtis, published by the Norman W. Henley Publishing Company, 1920

Editor's Note:

I came across this book a few years ago and was particularly intriqued with this article in it on using electricity to stimulate the growth of plants. I just can't believe that the results the author reports are legitimate. If this scheme he describes did work as well as he says it did I wonder why it isn't being used today? Although this is probably not a subject ER should get into I think the article is a good read and I found the author's writing style to be quite entertaining. N6CSW

There appears to be a decided scarcity of data covering the process of plant culture through the agency of electricity. The contributions on the subject have been anything but specific in nature and this is due, in part, to the fact that most of the experimentation has been carried on by private investigators who, for various reasons, do not seem disposed to make public the results of their research. In this country, the greatest progress has probably been made by the agricultural departments of several schools and colleges, and it is to the excellent bulletins from this source that the author is indebted for much of the data that led to some private experimentation. While the present discussion is based upon this experimental work, the author does not wish to pose as an authority on the subject and the remarks herewith are offered in the hope that they may lead to some private research on the part of the readers. An interchange of ideas and experiences is invited and it is felt that such a policy will be conducive to a broader presentation of the subject in later editions of this book.

While the art of electroculture is almost wholly in the experimental stage, still it may be said that the experiments are productive of really practical results and the apparatus necessary for their performance is not expensive, providing the investigator is content to begin on a small scale.

There are several methods by which plant life may be stimulated with the electric current and, in treating of the subject, the author will outline these methods briefly in order that the detailed descriptions of the equipment necessary in each particular case may be made clear. The construction of the apparatus involved will then be covered and it will be optional with the experimenter whether he constructs his apparatus or buys certain parts of it ready-made from manufacturers. The latter course is desirable in many instances as many instruments are rather difficult of construction and can be purchased ready for use almost as cheaply as they can be made in the home workshop.

Electroculture Methods

The methods by means of which plant life may be stimulated with the electric current may be divided broadly under two headings: one, in which the rays from an electric lamp are permitted to fall upon the area under cultivation, and the other, that in which a high potential current is sent through a network of wires stretched over the plot of ground. This latter method may be further subdivided into two basic headings: One in which a high tension direct or low frequency alternating current is sent through the wires and, the other, that which employs a high potential,

high frequency current. The former is simpler and productive of very good results; the latter is the more effective and, in some cases its results have been spectacular.

Merely because the high tension discharge method was productive of the most encouraging results in the personal experience of the author this method will be discussed first of all. It is not claimed that this is the right or even the logical method; it simply "worked" where others failed in the case of one individual investigator who is naturally prejudiced thereby.

The subject under investigation was a bed of lettuce, 10 feet wide by 20 feet long. This was situated across a yard and 50 feet from the companion bed used for purposes of comparison. The two beds were boxed in with lumber and topsoil was taken from the same load for each; in fact, the conditions were as nearly identical as it was possible to make them. Four posts were set up at the electrical bed, in the corners of the plot as shown in Fig. 86. At a distance of 5 feet from the ground, ten wires were spanned from cross-arms attached to the poles. The wires were carefully insulated with two porcelain cleats in series at the end of each wire and a common lead connected the span of wires at one end as shown in the illustration. A ground connection is made by means of strips of galvanized iron "chicken wire" buried in the earth beneath the bed. The aerial conductor is brought to a small shed or other shelter arranged near the bed under cultivation and in this shed the high-tension transformer is placed. The power wires from the electric lighting circuit are carried to the transformer shed and a switch is conveniently placed both at the shed and at the point where the wires leave the house or pole.

CAUTION MUST BE OBSERVED

The utmost care must be used to prevent the possibility of persons coming in contact with the span of wire over the bed, or, indeed with either wire leaving the transformer secondary, as the voltage delivered at this point would produce a dangerous shock. To afford a safeguard in this particular, a fence should surround the plot and a contact be arranged at the gate in such a man-

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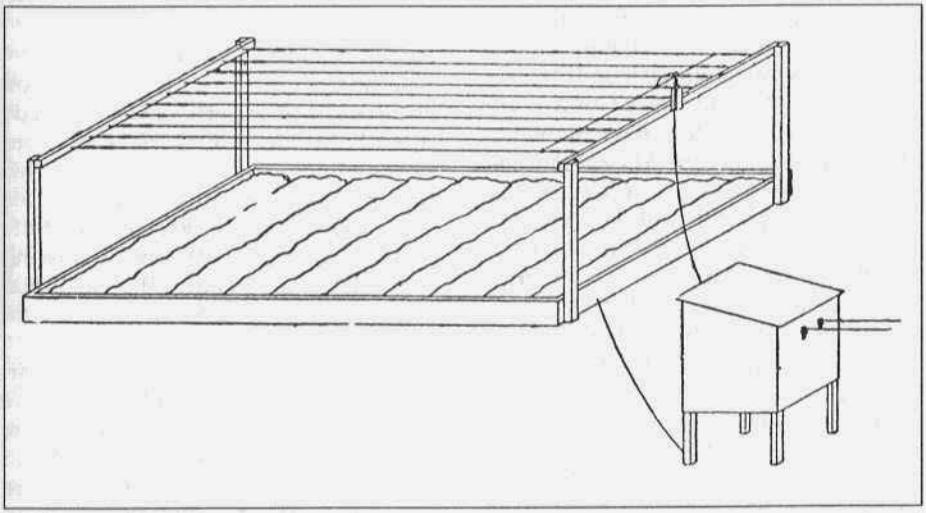


Figure 86, showing span of wires to carry the high tension current over a plot of ground in which plants are to be cultivated.

ner that when the gate is opened a bell will be caused to ring and this will remind one to turn the current off from the transformer before entering the gate. This device is not difficult to design and in fact it may consist of one of the familiar release pushes such as are used on door jambs.

The transformer used by the author delivered a potential of 100,000 volts and was rated at 1/2 kw. The construction was of the closed core variety and the instrument was immersed in oil to assist in cooling as the runs were 8 to 12 hours daily. Such an instrument can be purchased for a small sum from manufacturers of wireless telegraph apparatus and the experimenter is advised to buy one out-right. The necessary details are given, however, so that the ambitious worker may try his hand at the job if his courage is good.

Construction Of The Apparatus

The transformer to be described is generously proportioned in order to provide ample insulation and radiation surface. The constructional details for a transformer to operate on the usual 60-cycle, 110-volt supply are given herewith and in the full-page plate the worker will note that data for 25-cycle and 125-cycle instruments are given also. The windings for 70, 110 and 220 volts are appended as well.

From the working drawing, the core is seen to be built up from pieces of sheet iron or silicon steel .014 in. thick and 7-3/4 in. long by 2 in. wide. This is for the 60-cycle transformer. The same general directions apply in the case of the other frequencies, therefore the description will be confined to the one only. In all, 460 pieces will be required. If silicon steel can be obtained from some transformer manufacturer it should by all means be used as it is not expensive and its permeability is very much higher than that of ordinary sheet iron. The core irons are laid up alternately in piles until each has assumed a thickness of 2 inches, after which end pieces are fitted in the spaces left in the ends of the piles as shown in Fig.87. Friction tape should be wrapped around the pieces of iron to hold them in place.

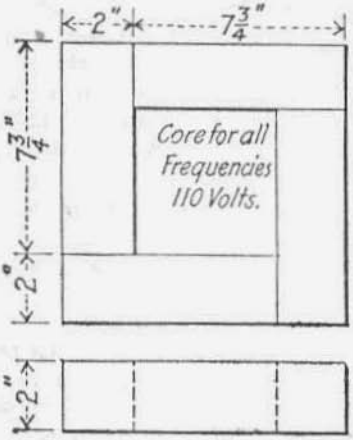
The primary coil consists of 350 turns of No.12 D.C.C. magnet wire wound upon a form which will give the opening in the coil a diameter of 3 inches. The primary may be wound to a length of 4-1/2 inches and after it has been removed from the form it should be carefully taped.

The secondary is wound in 2 sections, each containing 16,000 turns of No.34 enameled wire. These sections also have an opening 3 inches in diameter to permit their being placed over one leg of the core. The winding is in 80 layers and has 200 turns to each layer. A strip of oiled paper 2 inches wide separates each layer of wire from its neighbor and as the 200 turns will occupy a space of approximately 1-1/2 inches, it is obvious that a space of 1/4 inch will be left as a margin on each side of the paper.

The starting end of the winding of each section is soldered to a strip of thin copper ribbon which extends beyond the edge of the coil. The finishing end is likewise connected to a piece of ribbon which should come out on the opposite side to that of the starting end. The final layer of wire is covered with several thicknesses of the oiled paper to afford mechanical protection. The two sections of the secondary are to be wound in such manner as to permit the current to flow in the same direction around the core when the two starting ends are joined together.

The primary and secondary are to be assembled upon the core as shown in the drawing and the secondary sections are insulated from each other and the core by discs of heavy fibre. The remaining core irons may then be placed in position and the core clamped between wooden pieces as the drawing indicates. Pieces of flexible wire are

TRANSFORMER DATA



CYCLES	PRIMARY	SECONDARY
25	700 Turns No. 14 D.C.C.	64,000 Turns No. 36 Enam.
60	350 Turns . No. 12 D.C.C.	32,000 Turns No. 34 Enam.
125	175 Turns No. 12 D.C.C.	16,000 Turns No. 34 Enam.

joined to the secondary leads and the entire transformer is then placed in position in a sheet iron container made oil tight. Wires leading from the secondary and from the primary are brought to suitable terminals in the top of the transformer case. The case is then filled with transformer oil until the transformer is well covered. It is believed that the drawings will make the details clear and that further description is unnecessary.

It is, of course, understood that the line wires supplying the alternating current of sixty cycles at 110 volts are connected with the primary terminals while the secondary terminals deliver a current at approximately 10,000 volts to the span of wires over the plants to be cultivated; that is to say, one secondary wire leads to the overhead wires while the other secondary terminal is connected with the ground.

Actual Results Obtained

A most interesting report on electroculture experiments was made recently by Mr. T. C. Martin at a convention of electrical men and from this report it may be deduced that, of all the processes by means of which plant life may be stimulated, the one employing the high frequency current as its fundamental principle is the most successful by far.

The experiments mentioned by Mr. Martin were carried out at the Moraine Farm, a few miles south of Dayton, Ohio, and located in the celebrated Miami River Valley. The experiments were promoted by F. M. Tait, formerly president of the National Electric Lamp Association, and were in the immediate

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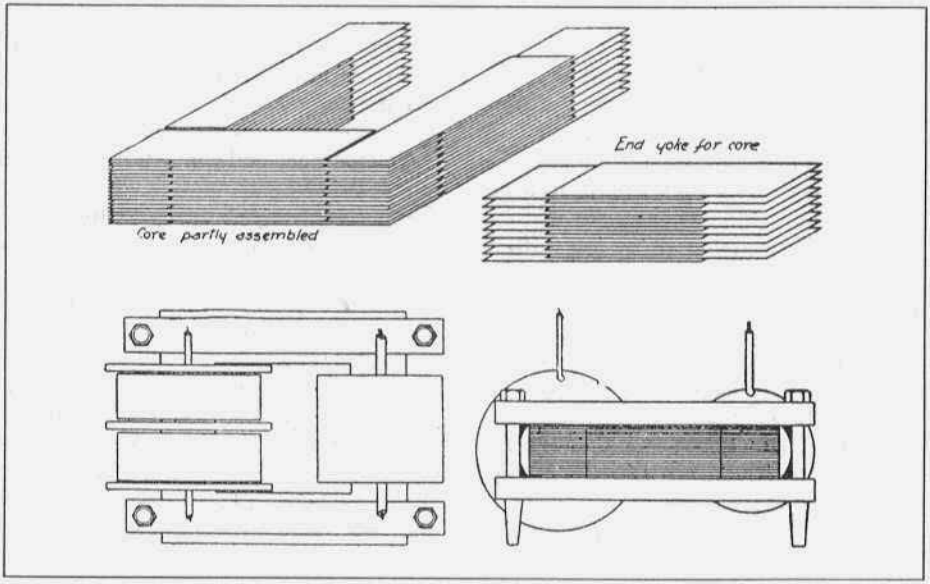


Figures 87, 88 and 89. Details of the high potential transformer.

charge of Dr. Herbert G. Dorsey, whose work in this line has long been worthy of note.

"In preliminary test, according to Mr. Martin's report," says the Philadelphia Inquirer, "small plots were marked off for exposure to different kinds of electrification. To insure that the soil of one plot was not better than that of another, top earth was collected, mixed and sifted and then was laid to the uniform depth of seven inches over the entire area." To quote further:

"In the soil of Plot No.1 was buried a wire screen. Over the plot was a network of wire, stretched about 15 inches from the ground. Connecting the network above the ground and the screen below were several wire antenna. The screen was connected to one terminal of a Tesla coil and the network to the other. A transformer stepped a 110-volt alternating current up to 5,000 volts, charging a condenser of tinfoil and glass plates, which discharged through a primary of the coil. About 130 watts were operated for an hour each morning and evening.

"Plot No.2 was illuminated by a 100-watt tungsten lamp with a ruby bulb. The light was turned on for three hours daily beginning at sundown. Plot No.3 was illuminated the same way, except that a mercury vapor lamp was used. No.4 had no artificial stimulation of any kind, being intended as a comparison between electrically excited plant growth and that of natural conditions.

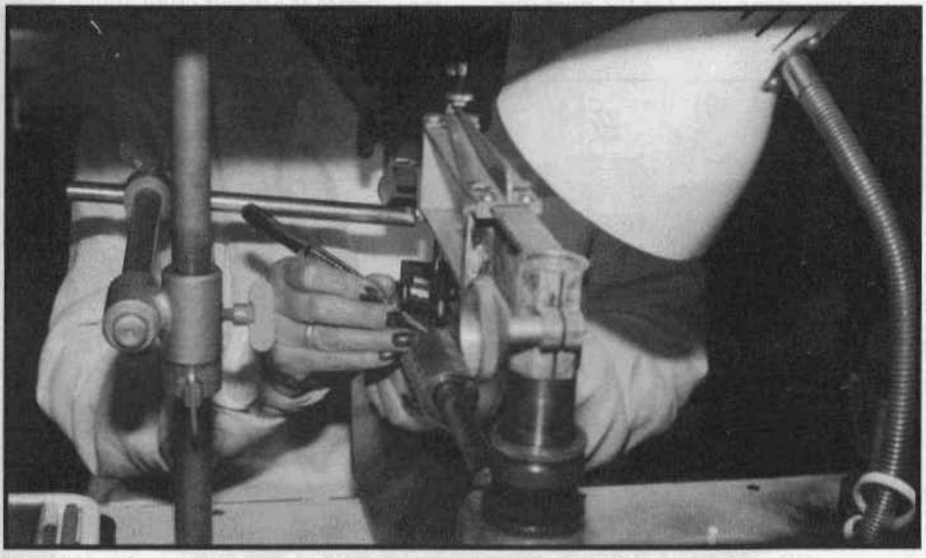
"In Plot No.5 was buried a wire network connected to the terminal of a 110-volt direct current. The positive terminal was attached to a small sprinkling can with a carbon electrode in its center. The can being filled, the water was subjected to electrolysis for several minutes. The plot was then sprinkled from the can, the theory being that the current might flow from the can, through the streams of water to the soil.

"Plots No. 6 and 7 were subdivided into four individual boxes, two feet square, separated by porcelain insulators and arranged with carbon electrodes at each end. To these electrodes were applied both direct and alternating currents.

"After radish and lettuce seed had been planted and germination had begun, the various methods of electrification were tried with extreme care. The result of the experiments showed that the plants in Plot No.1 grew in every instance far more rapidly than those in the other beds and more than double the normal growth as shown in the unelectrified bed."

The comparative results obtained with the various processes may be noted in the table which follows, and it is interesting to observe that the high frequency current from the Tesla coil takes the lead from the standpoint of weight of the edible portion of both radishes and lettuce grown under its influence:

Radishes (ten plants selected at random):	Plot 1 Tesla Coil	Plot 2 Ruby Light	Plot 3 Mercury Vapor	Plot 4 Normal	Plot 5 Elec. Spkg.
Total plant weight, grams	265.70	137.80	109.50	180.00	78.50
Edible portion, grams	139.50	57.40	40.90	79.40	31.00
Edible portion, per cent	51.15	41.65	37.34	44.11	39.49
Tops and leaves, grams	120.50	75.70	65.90	95.00	41.50
Tops and leaves, per cent	43.35	54.92	60.18	52.77	55.66
Roots, grams	9.30	4.70	3.20	5.60	6.00
Roots, per cent	3.50	3.43	2.48	3.12	4.85
Lettuce (ten plants selected at random)	67.00	52.60	56.60	46.10	31.30
Edible portion, grams	60.70	57.30	50.20	41.80	28.20
Edible portion, per cent	90.59	89.92	88.85	90.67	92.10
Roots, grams	6.30	5.30	6.30	4.30	3.10
Roots, per cent.	9.41	10.08	11.15	9.33	7.99



Winding of mesh filament for the Svetlana 3CX3000A7 & 4CX10,000C.

Cyber-Tour of Svetlana Vacuum Tube Manufacturing.

Svetlana invites you to take a fascinating cyber-tour of Svetlana's tube manufacturing facility in St. Petersburg, Russia. Go to The Tube Zone at www.svetlana.com and click on "What's New" to view a series of photographs recently taken at the Svetlana plant in St. Petersburg.

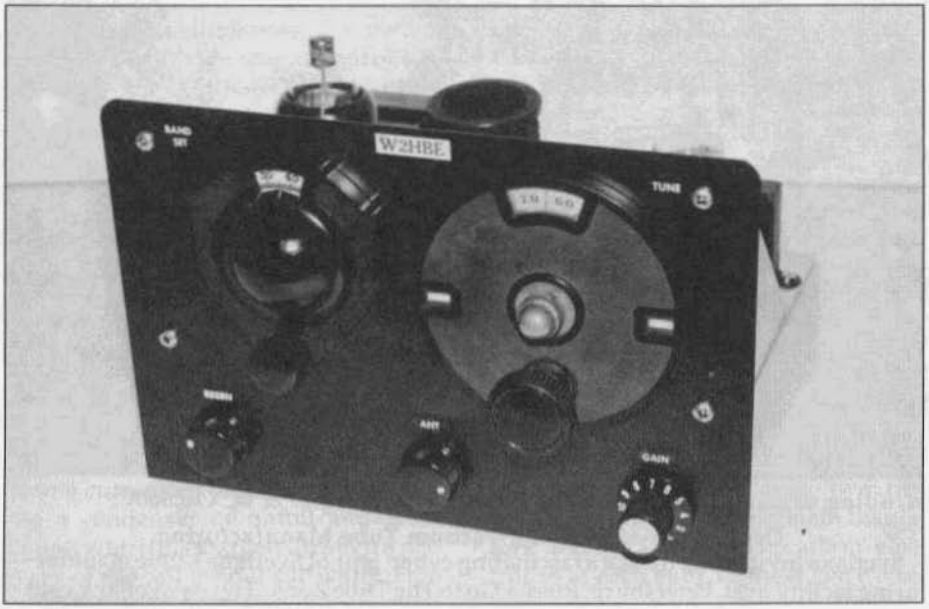
An Improved 2-Tube Regen

by Bob Dennison, W2HBE
82 Virginia Ave.
Westmont, NJ 08108

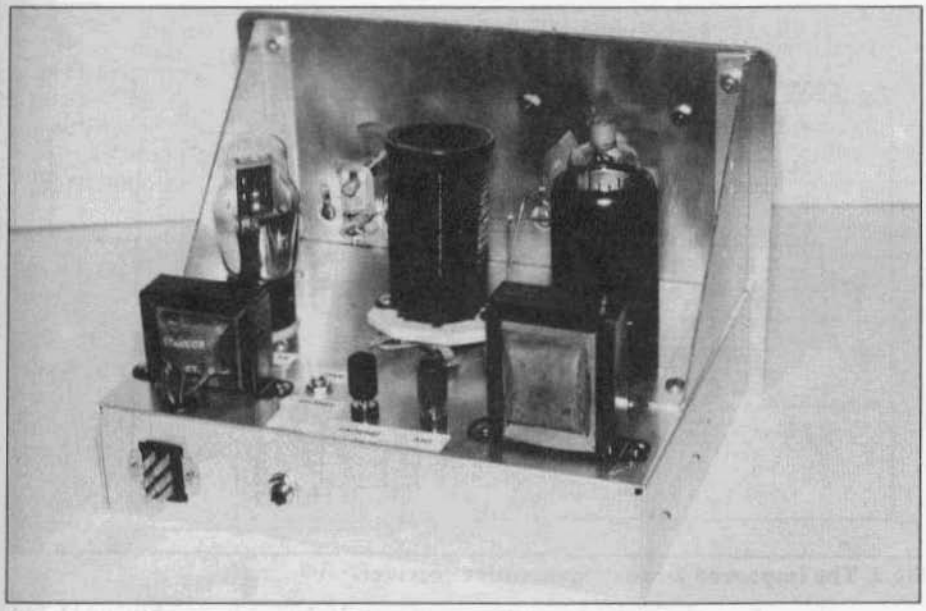
Many of the regenerative receivers built during the decade before WWII were inspired by articles written by George Grammer which appeared in QST and the ARRL Handbooks. One set that was especially popular and widely copied was the 3-tube TRF set employing a 58 RF, 57 Det and 56 Audio. This receiver was described in the January 1933 QST. It was a difficult set to build because of its drum dial, separate RF and Det compartments and problems associated with ganging the tuning condensers. But in spite of these problems, copies of this set sprang up all over town. When I got my ham license in 1936 I bought one of these sets for $10 and it served me well for the next four years while I was in high school.

In the June 1934 QST, George Grammer set forth the merits of the simple 2-tube regenerative receiver and provided plans for building a set using a 57 Det and 56 Audio. My dear friend and childhood mentor, Louis Davis, W9VVW, built one of these sets and used it while in high school. The only problem he had was that his 57 tube was microphonic. We found most of our tubes in the trash can behind the PHILCO store. Remember, this was during the depression years.

WHICH CIRCUIT? About six months ago, I got the urge to build an old-time regenerative receiver to use in the AWA Old Time QSO Party. After reviewing the Grammer articles cited above, I decided that my set would use a 57 Det



Front view of the author's Improved 2-Tube Regen.



Rear view of the 2-tube regen. Note the Jones plug on the left that connects the receiver to the outboard power supply/audio amp.

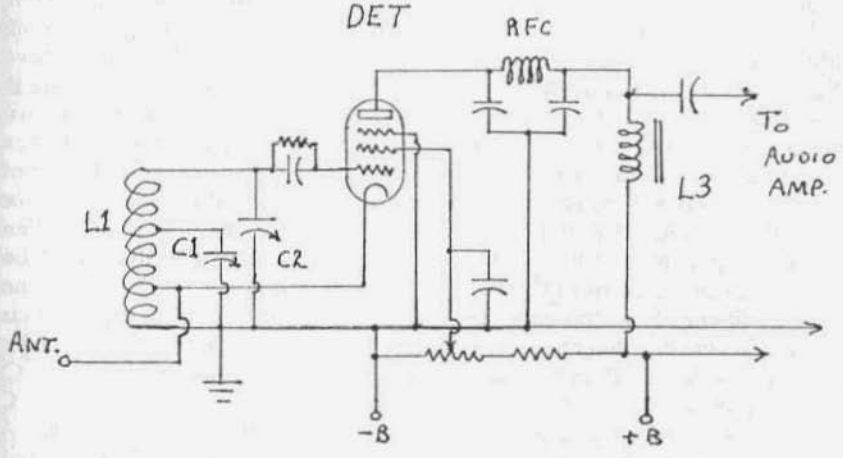


Fig.1. The June 1934, QST detector circuit.

and 56 audio. The detector circuit was to be like that shown in the 1934 QST article shown here in Fig. 1. Regeneration was achieved by connecting the detector's cathode to a tap on the coil as is done in the Hartley oscillator. On the 80 meter coil, the tap was usually about one turn from the ground end. The amount of regeneration was controlled by varying the screen voltage. In the Grammer 2-tube set, the antenna was connected to the cathode tap. Thus the

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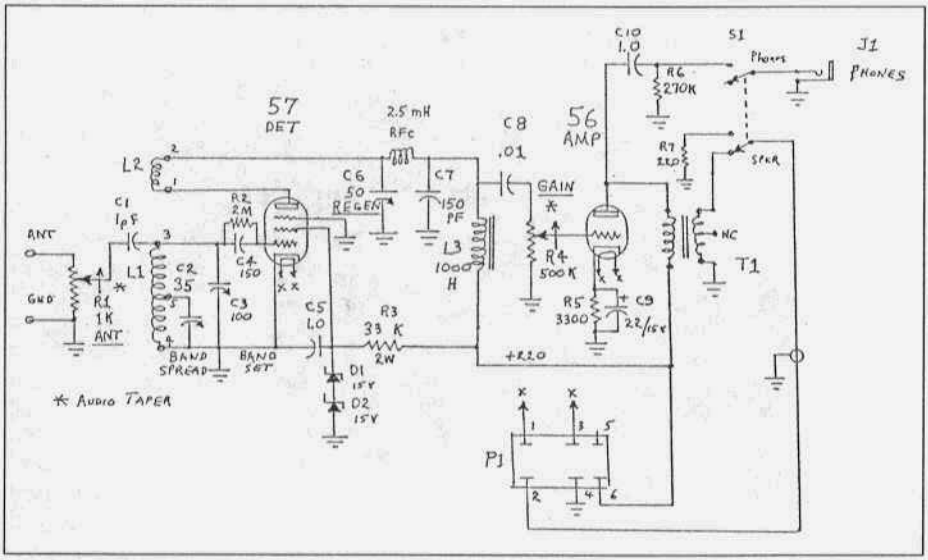

Fig.2. The improved 2-tube regenerative receiver.

lower part of the coil did double duty providing both antenna coupling and feedback for regeneration. If your antenna was just right, you might be lucky and get satisfactory results.

Well, it didn't work for me. I moved the cathode tap up and down to no avail. Screen voltage necessary to start oscillation varied from 5 to 45 volts. After several days of utter frustration, I abandoned the cathode tap circuit and tried the old trusty tickler coil circuit as shown in Fig.2. I fixed the screen voltage at the preferred value of 30 volts by means of zener diodes D1 and D2. This solved the problem of the screen voltage jumping when the detector went into or out of oscillation. Regeneration is now controlled by the throttle condenser, C6. Here I used a Hammarlund MC-100 variable with all but five plates removed to convert it to 50 pF. Another benefit of this circuit is that the cathode is grounded which minimizes the danger of bum modulation of signals due to heater-cathode leakage. Now the set was working great. I had to change the labels on two controls and do a lot of rewiring but it was worth it.

CALIBRATED BANDSPREAD. The 1933 QST set used a 35pF variable in parallel with the main 100pF tuning condenser. This was a rather poor arrangement because it couldn't give the desired amount of bandspread on any of the ham bands. The 1934 set improved the bandspread system by tapping the bandspread tuning condenser down on the coil. Thus any desired bandspread could be achieved. In the 1934 set both the bandset and the bandspread condensers were 100pF variables. Frank Jones in his 1937 RADIO Handbook claims that some selectivity is lost when the tuning condenser is tapped too far down on the coil. To minimize such loss we should use a smaller capacitor at C1. I removed all but five plates from C1 converting it to a 35pF variable. As stated earlier, this set will be used only in the AWA Old Time QSO Party. I connected the bandspread condenser to a point on the coil that resulted in a tuning rate of 1 kHz per dial division. Thus when the bandset dial is set properly, the bandspread dial will directly indicate frequency in kHz. Thus 50 tunes 3550 kHz, 60 tunes 3560 kHz, etc.

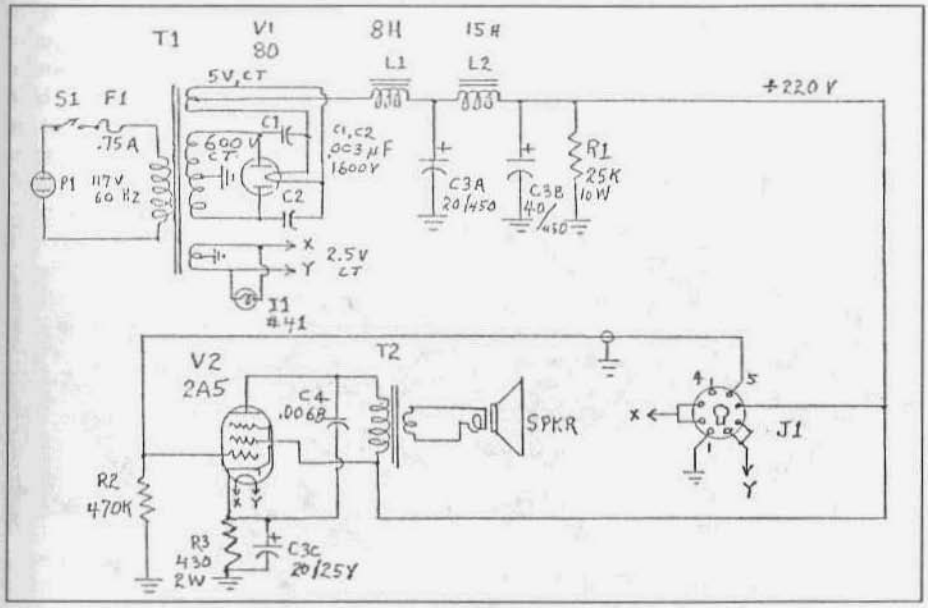

Fig.3. Power unit for the 2-tube receiver.

Fig.4. COIL DATA: L1 consists of 27 turns of No. 22E wire on a 1½ inch diameter coil form. Length of L1 is 1½ inches. The bandspread tap is at 10.75 turns (see text). The tickler winding, L2, consists of 5 turns of No. 26E wire close-wound 1/8 inch below L1. Ribs on coil form not shown for clarity.

Coat finished coil with Q MAX or liquid polystyrene coil dope.

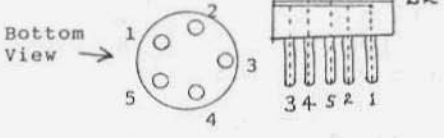

PLATE CHOKE. Both of the Grammer sets employed impedance coupling to the audio stage. The 1933 set used an audio transformer with the windings connected in series. Grammer found that his transformer had a resonant peak near 1000 Hz which was advantageous in a Cw receiver. In the 1934 article, Mr. Grammer points out that the use of an audio transformer often leads to fringe howl and he recommends using one of the audio chokes especially designed for coupling a screen grid detector to the following audio stage. My friend, Louie, gave me one of these chokes, a Thordarson T-29C27 1080 H choke. If you use a transformer with series-connected windings and experience fringe howl, it can usually be cured by shunting it with a resistor. Use the highest value that will stop the fringe howl.

THE AUDIO STAGE uses a 56 tube with 13 volts cathode bias. In my receivers I avoid having plate voltage on the headphones for safety reasons. Here, T1 acts as a plate choke when phones are used and it becomes a normal plate-

continued on page 42

Angel Modulation in an 8,000 lb NATO Wrapper

by Randy Best, WA7CPA
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randybest@home.com

UNIMOG: from the German name UNIversal-MOtor-Gerät, (universal motor equipment).

Last year I purchased my UNIMOG from Shep, AA7MH, who had imported several of these ex-army vehicles from Germany and Holland. He had flown over there to handpick the units himself.

UNIMOG is a name that stands alone for one of the best light truck families ever made. UNIMOGs are in military and civilian service all over the world; over 298,779 were produced from 1948 through 1993.

Who would have ever guessed that the UNIMOG is something like an unintentional son of Henry Morgenthau? In 1944 he proposed to transform post-war Germany into an agrarian state. Beginning in 1945 many industrial plants, if not destroyed or bombed, were dismantled and packed into railroad cars for shipment abroad to places such as Russia, the United Kingdom or France.

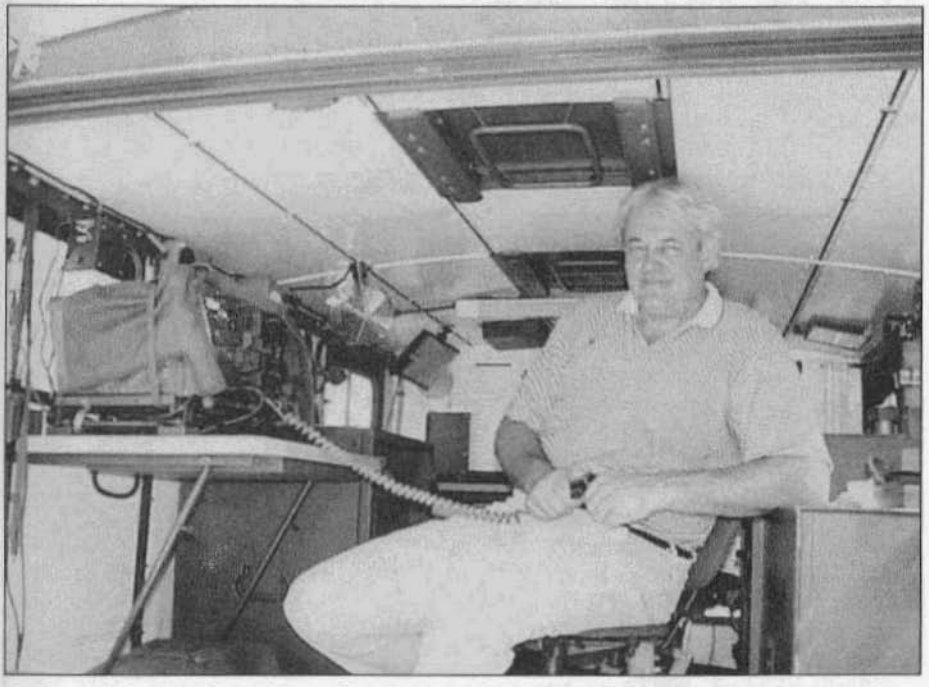
Faced with that situation Albert Friedrich (former chief engineer of Daimler-Benz's aircraft engine research division) started in December 1945, developing a highly specialized vehicle for agriculture. His concept was for a four-wheel drive, self locking differentials, high ground clearance (by rigid portal axles), with power take-offs at

the front and rear, a small loading platform, a driver's cab for two people, extremely low speed for working in the fields, and with highway capability for up to 50 km/h (30 mph). The project started in a factory at Schwäbisch Gmünd, in southern Germany, in the Gold und Silberfabrik Erhand & Söhne. The company had never before been involved in making vehicles or tractors.

My UNIMOG was manufactured in 1966 and served in the German Army. Other NATO countries like France, Switzerland, and Holland used them as well. The license plate on the front bumper is Dutch. Other models like troop carriers/transports and fire truck (tank/pumper) rear assemblies are also available. UNIMOG fire trucks are popular with rural fire departments since a pumper version could also drive a mondo snow blower attachment with an engine driven PTO arrangement.

Accessories: I completed the vehicular restoration with almost 100% completeness.

- tire chains
- air hose to fill tires from the trailer air system
- RF ground auger with ground wire for vehicle frame connection
- 3 five-gallon "gerry" cans that don't leak
- 0-28 VDC gasoline generator with cables
- new 10 ply tires
- custom wheel chocks
- side door blackout tent
- full blackout window covers
- convoy lighting system
- gasoline heater assembly - flame throwing death trap, pretty to look at only
- Cubic Corporation mine detector - don't ask, ya never know!
- 2 chairs mit seat belts



"A Boy With His Toy". The author looking out from the radio operating position. The manual describes the rear compartment as the 'radio box'.

continued next page

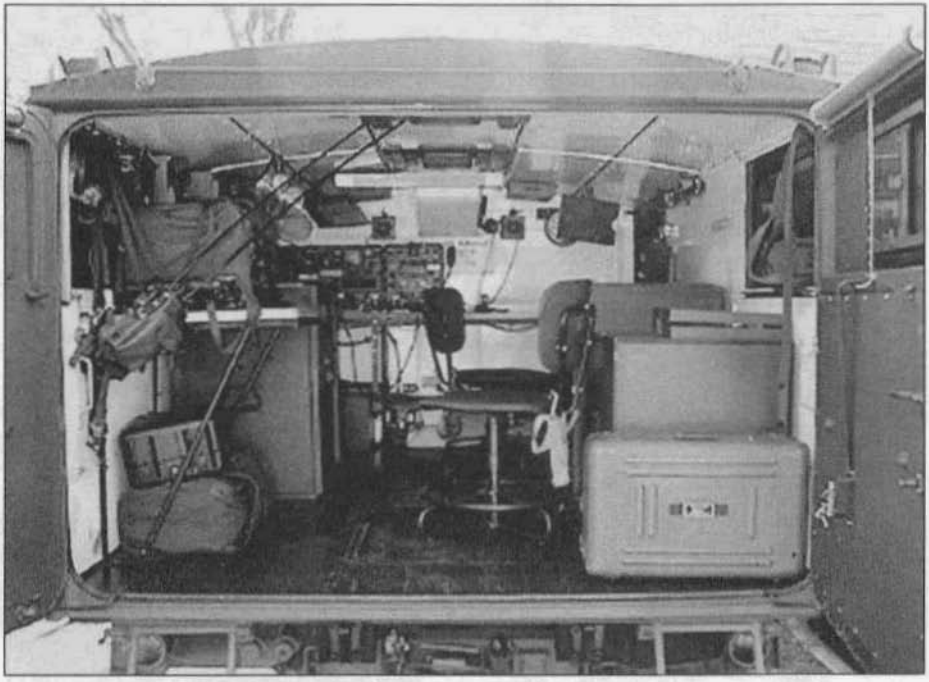
The Radio Box

The radio box has its own set of 12 volt batteries in series charged from the generator in the engine compartment or the 2-cycle ground-mounted gasoline generator. The side door has a tent assembly to enable nighttime ingress and egress without letting any light out.

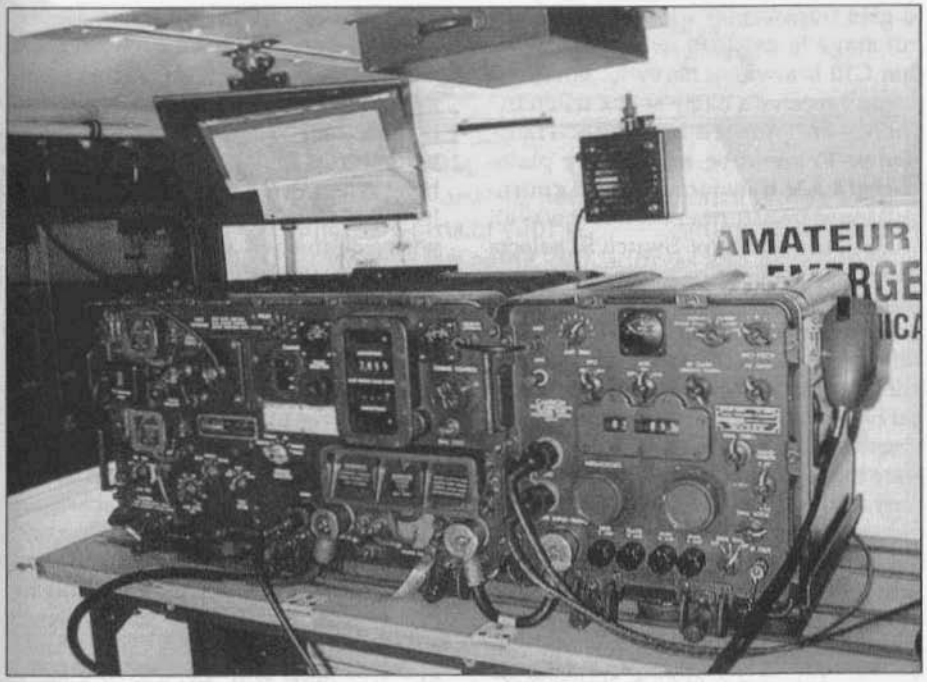
The vehicle has a separate pair of batteries in another battery compartment. A very nice 28 VDC power distribution system was intact complete with breakers. Fully shock mounted radio desks were also complete and extremely well constructed—they have to be to support the GRC-19!

I located enough bits and pieces to restore and install VRC-10 and GRC-19 radios with original shock mounts and antennas. I also located some helmet radios and tactical German radios (SEM 52s) currently under construction for 6 meter FM.

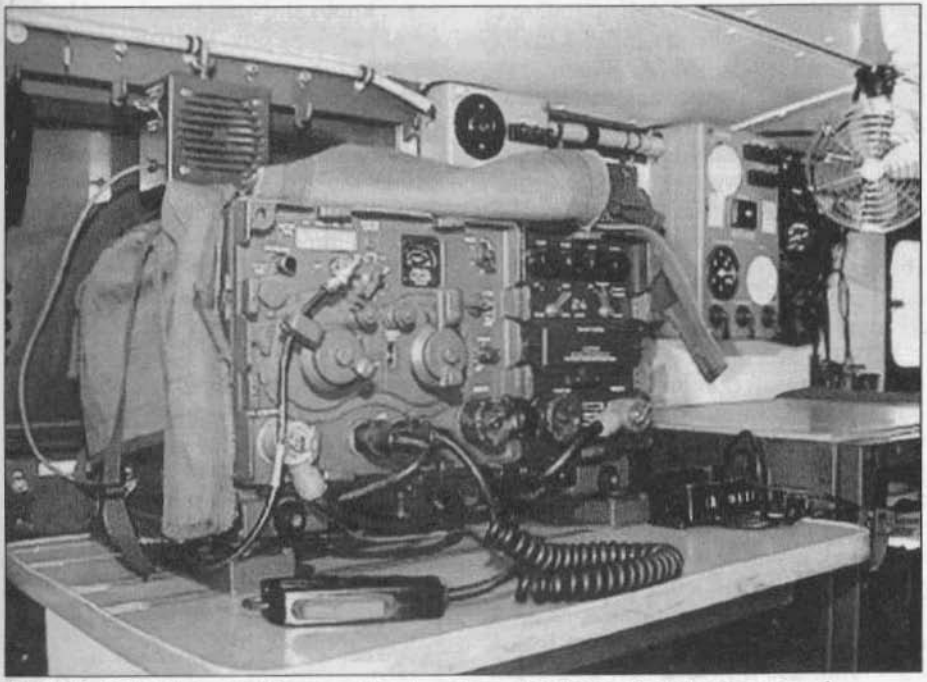
The project has been challenging and fun. After the January 28 antique military show at the Arizona National Guard Museum I plan to park the beast behind a garage and operate on 3855 on the weekend mornings. Since the T-195 sports a single 4X-150 PA, modulated by a pair of 4X-150Ds the only AM "mod" required was replacing the "pork chop" carbon mic with a Motorola mic designed to replace carbon types. That made a HUGE difference in audio quality. No series dropping resistors were required. The Motorola mic runs nicely on 28VDC. I tried baking and shaking the carbon elements to no avail—may they rest in peace. ER



Looking into the 'radio box' with rear doors open



GRC-19, T-195 transmitter, R-392 receiver, AM/CM/RTTY



VRC-10, 38-52 Mhz FM transmitter/receiver, 28 VDC distribution panel

An Improved 2-Tube Regen from page 37
to-grid transformer when the 2A5 output stage is used. Resistor R6 insures that C10 is always charged so that one doesn't receive a nasty shock when the phones are plugged in. NOTE: Transformer T1 could be an ordinary plate-to-grid audio transformer. I used a push-pull input transformer because t was all I had in my junk box. Switch S1 selects either headphones or loudspeaker.

AN RF GAIN CONTROL. Simple regenerative receivers lack selectivity and suffer from limited strong signal handling capability. Thus a very strong signal on a closely adjacent frequency may overwhelm or block the detector and obliterate the weaker signal you are trying to copy. Quite often the solution is simply to reduce the level of the strong signal to a manageable level. Thus we need an RF gain control between the antenna and the detector. I don't recall ever having heard about such an idea. I never saw a circuit in any QST or Handbook showing or describing such a feature. Well, don't despair. It's relatively easy if operation is confined to the low bands. In Fig.2, the RF gain control is labelled "ANT" and consists of a 1000 ohm potentiometer with an audio taper. Since the antenna coupling condenser, C1, is only 1pF, the gain control has very little effect on receiver frequency. I normally run the RF gain control at about 75% and if the setting is changed to accommodate either a weak or strong signal, the frequency change is no more than 120 Hz.

POWER SUPPLY. Fig.3 shows the circuitry of the power supply and the audio output stage. Buffer condensers C1 and C2 are an old time idea recommended to prevent tunable hum which often plagues regenerative receivers. A two section filter is employed to insure quiet, hum free reception. If you want your power supply to be really neat looking, it is a good idea to make a wiring harness. Make a drawing (full size) of the bottom inside view and fasten it to a 5/8 inch thick board. Drive one inch brads into the board at those points where the harness will turn 90 degrees or have a branch point. Cut and strip wires and lay them in place on the drawing. As the cable grows it will be necessary to lash the wires together temporarily. Nylon cable ties are handy here. When all the wires are in place, use lacing cord to tie the wires into a neat wiring harness. Remove the temporary nylon ties. Varnish the cable and hang it up to dry. Your finished power supply will look like a factory job and you will be proud of a job well done.

CONSTRUCTION & COIL DATA. This receiver was built on a 9X7X2 inch aluminum chassis. The panel is 9.75 inches wide and 6.25 inches high and is .062 inches thick. Sturdy angle brackets are used at each end of the panel. The panel was undercoated with Sherwin-Williams 00343 yellow primer made especially for non-ferrous metals then given several coats of satin black enamel. Control labelling was done with Dri-Transfer lettering.

For knobs and dials I used what I could find in my junk box. The bandset dial is a three inch Kurz Kasch dial. An old four inch Marco dial is used for bandspread tuning.

As stated earlier, this set was made for use in the AWA Old Time QSO Party. Thus only one coil has been made to date. See Fig.4 for details.

CONCLUSION. I'm looking forward to using this set in the next AWA contest. I may not work as many stations as when I use my Kenwood receiver. But it should be more fun because I will be reliving the old-time experiences of coping with QRM while using "Antique" equipment. My transmitter is a '45 Hartley oscillator running 10 watts input so please be patient if you work me and I ask for a repeat! ER

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FOR SALE: KWM-2 fan bracket - $12 ppd. Dave Ishmael, WA6VVL,2222 Sycamore Ave.,Tustin CA 92780. (714) 573-0901.

FOR SALE: Small parts, transformers for projects and repairs of tube gear.Let me know your needs. Van Field, W2OQI, 17 Inwood Rd. Center, Moriches, NY 11934. (516) 878-1591 or wreck_and_rescue@juno.com

FOR SALE: R-390A with slicer, arrived at QTH 3 or more years ago, still unpacked - $500. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: NOS,UTC # F-7101 matching (600-8 ohms) xfmrs (2 W) - $13 ppd./dom/USA. ABEN, POB 4118, Jersey City, NJ 07304-0118,Avidov@aol.com

FOR SALE: Viking II with 122 VFO - $200 plus shpg. Prefer pickup. Dick Bean, K1HC, 422 Everett St., Westwood, MA 02090-2218. (781) 461-0101, k1hc@aol.com

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, others. Also some military, test equipment,VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: Tubes, Penta Labs, 811A- $20.; 572B- $55.; 3-500Z- $170.; ZG also avail.(these are Amer. made); NOS 811A- $35.. Many other US NOS. VISA/MC. Dee, W4PNT, VA (540) 249-3161, soundnmind@rica.net

FOR SALE: Hallicrafters, Drake, Heathkit, Military, etc. Send e-mail request or SASE for list #2. Fenton Wood, 109 Shoreline Dr., Star Harbor, Malakoff, TX 75148. fenton@tvec.net

FOR TRADE: HT9, gray. Will trade for prewar xmtr/rcvrs. Will not ship. Carl, WA1KPD, CT, (860) 663-3676, cnord@snet.net

FOR SALE: Hallicrafters SX-96, w/manual, good condx, mint R-46B spkr - Make offer. WØPIG, (651) 699-7932, mannyblock@aol.com

FOR SALE: Telephones, breast plate & headphone circa 1910; space saver 211 & ringer box. Earl Carter,W4EU, 11310 Pine Acres Ln., Chesterland, OH 44026. (440) 729-2588

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 105 Sweet Bay Ln, Carrollton, GA 30116. wa4kcy@usa.net

WANTED: E. F. Johnson Co. HAMALOGs, unusual photos and information 1923-70. Bruce Hering, 41120 State Highway 13, Waseca, MN 56093. (507) 835-5619. bhering@efjohnson.com

WANTED: Top dollar paid for Winchester Radios and Winchester related items. Donald Daggett, 122 Hall Rd., Grahamsville, NY 12740. (914) 985-7249, wc2e@webtv.com

WANTED: Owners of the John Leary, W9WHM, re-engineered Hammarlund SP-600 rcvr, seeking info and serial number of rcvr. Bill Mills, KC4AA, (912) 452-2957, wmills@gmc.cc.ga.us.

WANTED: Galaxy V accessories (F-3, DAC-35, SC-1, RV-1, etc); cabinet for 600L. Tom Hoitenga, K8NGV, GA, (770) 426-8682, hoitenga@bellsouth.net

WANTED: SW-3 Coils any band. Pre 1935 ham, pre 1925 broadcast, wireless equip. Mike Bald WD5GLW, (918) 492-7361, radiomb@aol.com

WANTED: Control Box comtpatible w/CDR AR-22 rotor. Bernie Doermann, WA6HDY, 200 James Way, Arroyo Grande, CA 93420. (805) 481-6558

WANTED: Eddystone or James Millen slide-rule dial. KØYQX, 906 Adams St., Mankato, MN 56001 (507) 387-3840, mobeng@mnic.net

WANTED: Popular Electronics Magazine 1975, audio input, output xfmrs, Publisher For Antique Catalogs. V. Vogt, 330 SW 43rd St. #247, Renton, WA 98055. (206) 295-4418, vcvmav@webtv.net

WANTED: Collins 30S-1 in very good condx. Prefer PNW area for PU. k7jb@ptld.uswest.net

WANTED: Navy equip w/SE- series datatags; any info on Navy model TBT. William Donzelli, 15 Gen. MacArthur Dr., Carmel, NY, 10512. (914) 225-2547, william@ans.net

WANTED: A metal cabinet and a panel meter for the WRL Globe Chief 90 xmtr. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968, imq@bellsouth.net

WANTED: Miller AM tuner model 595; RCA Radiomarine direction finder model AR8712 and RCA rcvr model 18T service manuals. Al Kaiser, W3LEQ, 713 Marlowe Rd., Cherry Hill, NJ 08003-1551. (609) 424-5387

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376, bglcc@aol.com

WANTED: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K-(any); 302C-1, 312A-1. **FOR SALE:** SC-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

WANTED: Heath Gear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49009. (616) 375-7978, billrobb@net-link.net

WANTED: Historical info on development of 12AT7, 12AU7 and 12AX7. Which of these was first, when, production info, etc. Tech info not needed. Kurt Miska, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (248) 641-0044 (w), Fax 641-1718, khm@tir.com

WANTED: I wish to correspond with owners of National FB7/FBXA/AGS coil sets. Jim, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511. j.c.clifford@juno.com

WANTED: Military radios, USR-550/ARR-40 rcvr; Soviet xcvrs R-112, R-173. Leroy Sparks, W6SYC, 924 W. McFadden Ave, Santa Ana CA 92707-1114. (714) 540-8123

WANTED: Control head for Collins Airborne 618M and any other VHF airborne rx or trx; control head manual basemount and any acc. Shigaki/JA6IBX, shigaki@mse.biglobe.ne.jp fax-Japan-(0)96-329-4601

WANTED: HV pwr xfmr 3000 VDC at 3+KVA. State price, condx, weight, input/output voltages KVA rating. W1BY, 26 Foster Rd., Essex Jct., VT 05452. al w1by@hotmail.com

WANTED: National HRO-500 receiver dead or alive. Spencer Cromwell, K6VRS, 7607 Stevenson Way, San Diego, CA 92120. (619) 582-8280, kvrs@aol.com

WANTED: Original manual for RAK-7/RAL-7 rcvr, all wirewound controls, nameplates, 874 and 876 tubes. Sandy W5TVW, 417 Ridgewood Dr., Metairie, LA 70001. ebjr@worldnet.att.net

WANTED: Globe 755 VFO; Collins 32V2 or 3 xmtr. Travis, K5AVH, 1206 Canadian, Texarkana, TX 75503. (903) 792-2080, k5avh@slinknet.com

WANTED: Collins 800 hz cw filter F455FA-08, Johnson Ranger II, 75A4 lid, Viking II. Scott WA9WFA, MN, (651) 653-2054, scott.freeberg@guidant.com

WANTED: B&W 51SB-B SSB generator in good working condx. Greg, N4OSJ, (770) 552-0640, n4osj@yahoo.com

WANTED: Manual/schematic, or copy of, for Harvey Wells SM-1 station monitor. Kelley, W8GFG, (219) 365-4730

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FOR SALE: Ten-Tec 2KW antenna tuner Mod 238, esc condx w/manual - $295. Lee, (702) 575-6705, ltb@birdhouse.fernley.nv.us

FOR SALE: Dentron MT-2000A 3KW antenna tuner - $140, BC-906 frequency meter - $20, REL wavemeter-$20. Carter, WD4AYS, (804) 979-7383, celliott14@aol.com

FOR SALE: US Army Signal Corps special edition February 1944 Radio News, one inch thick w/specs & color photos - $75. Jim Riff, 9411 E. Happy Valley Rd., Scottsdale, AZ 85255. (602) 473-1098, k7sc@cybertrails.com

FOR SALE: Johnson Viking II,radio band control - $165; Heath SB 401,SB 300,620,610,600, oscilloscope, misc. parts, old tubes, manuals. C.McPherson,CA, (707) 785-2947,alclair@mcn.org

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FOR SALE: Collins 30L1 owners new Cetron 811A's - $19; 32V owners Raytheon 4D32 - $19; major credit cards accepted. Don, W4GIT, FL, (352) 475-3306.

FOR SALE: Cleaning part of shack. SASE or email for equip & parts list. Earl, K6GPB, 5319 Sierra Vista Rd., Murphys, CA 95247. earlw@goldrush.com

FOR SALE: Heath Nostalgia, 124 pg book contains history, pictures, many stories by longtime Heath employees. (See BOOKS inside back cover.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028.

FOR SALE: Ritter Loop Aerial replicas from the 1920s, look wonderful on any antique radio, unfinished or stained & lacquered w/orig insturctions - $20, ppd. Bill Turner, WA0ABI, 1117 Pike St., Saint Charles, MO 63301. (314) 949-2210, dialcover@webtv.net

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FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave,2 Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. (516) 653-5350

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FOR SALE: New Ranger I, Valiant I & Navigator plaster dials, 160-10 frequency no's in green, with all holes like original - $17.50 ppd. Bruce Kryder, 336 Sliders Knob, Franklin, TN 37067. (615) 794-9692

FOR SALE: Collins meatball lapel pin - $5.95 + $.75 S&H. George Pugsley, W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029

FOR SALE: Hallicrafters SR-34 - $250; 6/2 meter am/cw, telescoping antenna, cover, manual, 110VAC & 12VDC supplies are installed; YeasuFT-101E, ext display, monitor scope, board extenders, near mint (call). Randy, WA7CPA, AZ, (602) 266-2256, randybest@home.com

FOR SALE: Johnson Signal Sentry - $45; Dow-Key TR switch - $35. You ship. Prefer contact via email to robb@cruzio.com. Rob, K6RB, Santa Cruz, CA

FOR SALE: Collins S- Line, 32S-3, 75S-3B, 312-B4 & 30L-1, & CP-1 xtal pack along w/full set of spare tubes. All Round Emblem. I would like to sell these as a set if possible. Please call Lloyd Roach, W3QT, (610) 466-7800, w3qt@aol.com

FOR SALE: Globe Scout 680 - $150 (Uship); Hallicrafters SX28 w/SP44 Panadapter - $300 (AZ pickup only). Bob, K6GKU, AZ (602) 770-7829

FOR SALE: CE 10B w/manual - $85; Adventurer w/manual - $50; manual copy for HR-10B - $5. Chuck, NZ5M, (806) 798-1452.

FOR SALE: 0 to 2.5 kilovolt Westinghouse meter - $30; Collins sq 500 mA meter - $35; ant relay exact of Collins square 115 AC. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Magazines, manuals, surplus books, some surplus xfmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580

FOR SALE: QSL cards, mostly 1930s & 40s - $50 ($.21 each). Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793

FOR SALE: Sell/Buy/Wanted/Trade: Vintage equip at the "K8CX Ham Gallery." http://paradox2010.com/ham/ a free service.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@coffey.com

FOR SALE: 7 & 9-pin tubes, my choice, untested - 10/$1; Xmtg tube sale, list free. L. Gardner, 458 Two Mile Crk Rd., Tonawanda, NY 14150.

FOR SALE: Dr. Radio repairs vintage ham gear. Steve Trimble, K5DJH, Box 73, Weston, TX 75097-0073. (888) 73-K5DJH. k5djh@texoma.net

FOR SALE: Collins 51J series drum overlay - $10 ea, specify which. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net, (318) 989-3430

FOR SALE: Ham equip: Hallicrafters, National, Heath & others. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

FOR SALE: 8 channel tube type portable audio board, nice condx. Fred Clinger, OH, (419) 468-6117 after 6 PM.

FOR SALE: Rare Gates BC-250GY AM xmtr, rated at 250 watts, freq range of 540-1800 kc, uses (4) 810's & just checked out by an electrical engineer, unit seems to operate well, very heavy & quite large! Very collectable radio xmtr. Very serious inquires only please. Joel, MO, (417) 889-6415.

FOR SALE: NIB vacuum capacitor, 50mmfd@32kv - $25; 805 tubes (4), NIB $25 ea; NIB Bud JC-1575AUHF variable capacitor - $25; NIB 866A tubes(4) $10 ea; NIB 2AP1 CRT - $10. George Shuts, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505)298-7347.

FOR SALE: Hallicrafters equip, send long SASE for list. No sales until you receive my list. Ray Chase, 1350 Marlborough Ave., Plainfield, NJ 07060

WANTED: Hallicrafters Village/Hamlet radios TR-5/TR-20 & Gonset Civil Defense 6m radios/accessories, manuals also. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Fx/msg (310) 398-7159 or danielc411@aol.com

WANTED: Japanese WW2 Chi 4 radio plugin coils. Yes, Chi 4 not Chi Ichi. Stan, JA1DNQ fwgf8431@mb.infoweb.or.jp

WANTED: E.H. Scott Philharmonic rcvr. EA4JL, Contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: Variometers. Steve Gross, W9OJI, 602 W. First St., Mt. Morris, IL 61054. (815) 734-4255

WANTED: TMC 1758/URR SSB adapters, need (2) unmodified, working condx or complete, reasonable. John, WI, (715) 378-2466 after 8 PM.

WANTED: HW-29A, Heath "Sixer" (Lunchbox), unmodified, in good condx. Dave, W3AKP, VA, (703) 768-0257, dreese@mindspring.com

WANTED: Manual for a B&K tube tester model 707 dynajet. Jim Roden, OK, (918) 836-9113, jroden@aol.com

WANTED: Really need S meter & tuning knob for SX-100 or SX-99. Bill Cheatwood, WA4LXK, POB 121, Hope Hull, AL 36043.

WANTED: B&W type JEL coils; Vibroplex bug w/3 inch wide base; McElroy bug. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (724) 758-2688

WANTED: Schematic for HQ-170A & any upgrade info. Russ Poppleton, UT, (435) 245-3110.

WANTED: PE-120A & B pwr sply, top price paid. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60804.

WANTED: Heath SB-310. Willis, AR, (870) 857-3366.

WANTED: Hammarlund HC-10 SSB converter. Bill Mills, 188 Ellis Mill Rd. NE, Milledgeville, GA 31061-9020, wmills@gmc.cc.ga.us

WANTED: RCA dual Gate Mosfet 40673, no duds. Harry A. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

WANTED: Homebrew vacuum tube VFO from QST or ARRL Handbook, even repairable. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM

WANTED: Manual/copy for Lafayette HA-250. Fred Hoofer, WØBMT, POB 203, Neligh, NE 68756. (402) 887-5201

WANTED: DX 150B Radio Shack rcvrs. John L McDonald, W6SDM, CA, (805) 484-1307.

WANTED: Limpanders; RCA; Gates; Fairchild; Langevin b'cast gear. R. Robinson, CT, (203) 949-0871. richmix@erols.com

WANTED: Kleinschmidt teleprinter models: 311, 321, (AN/FGC-40, AN/GGC-16, AN/UGC-39...) Tom Kleinschmidt, 506 N. Maple St., Prospect Hts., IL 60070-1321. (847) 255-8128

WANTED: Old tube amps & xfmr's by Western Electric, UTC, Acro, Peerless, Thordarson; Jensen, JBL, EV, Altec, WE spkr's. Mike Somers, 2432 W. Frago, Chicago, IL 60645. (312) 338-0153

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc411@aol.com

WANTED: Any military entertainment radio (Morale rcvr), manuals, accessories, or data plates. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. ph/fx (707) 544-5179

WANTED: Visitors and tubes by museum. Old and odd amateur or commercial tubes, foreign and domestic purchased, traded or donations welcome. All correspondence answered. K6DIA, Ye Olde Transmitting Tube Museum, POB 97, Crescent City, CA 95531. (707) 464-6470

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756, wlhoward@gte.net

WANTED: Copy of MIL-T-27A spec, RCA, Gates, Langevin B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763, richmix@erols.com

WANTED: RCA 140, 141, AVR5A. GE K80, K80X, K85. Any condx. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. treherne@erols.com

WANTED: Broadcast gear; tube or solid-state, compressors, limiters, equalizers, microphones, consoles, micpreamps, recorders. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax or mstates@polarnet.com

WANTED: National HRO 500 & LF10; Hammarlund SP600-JX21A; Johnson AN/FRT-505. Ric, C6ANL, POB N4106, Nassau NP, Bahamas.

WANTED: Reward for lead on Drake 1A spkr; 5x7 spkr vertical black case 7x10, chrome strip across middle. K5YY, AR, (501) 756-5010.

WANTED: Nice DX-35 &/or DX-40; also I'd like to get into Collins. I would like to buy a 32S-(X) &/or a 75S-(X) at a reasonable price. Let me know what you have. I plan to use these, not collect them. Tom Thomson, W9CHP, 315 Wellhouse Dr., Kimberly, WI 54136. (920) 734-1068, tagthomson@aol.com

WANTED: Top cover for ARC-5 MD-7 modulator. Ken Kolthoff, K8AXH, 8967 Scott Dr., Desoto, KS 66018. (913) 585-1196, kolthoff@gvi.net

FOR SALE: CE10B w/manual - $85; Adventurer w/manual - $50; manual copy for HR-10B - $5. Chuck, NZ5M, TX, (806) 798-1452.

FOR SALE: Heath Apache - $175. **WANTED:** GLOBE 755A & Hallicrafters HA-5 VFOs. Bob, N1PRS, RI, (401) 723-1603.

FOR SALE: Swan 500C, sp/ps, mic, RF wattmeter 10-80 meter vert antenna, all exc - $400. Gene, W7MXM, ID, (208) 522-5854.

FOR SALE: Collins 51S-1 manufactured late 1975, includes correct cabinet w/metal trim ring, augument tool, 312-B spkr, orig sales literature, manual, & 351R-1 rack mount, CCA exc - $2000. Harve Nye, POB 424, Long Creek, OR 97856. (541) 421-3053

FOR SALE: Knight multimeter #KG-640 in good condx - $45; 43 issue's of ER (1995, '96, '97, '98) - $45. Cliff, W3LVC, MD, (410) 796-1070

FOR SALE: Latest AWA Review Volume II - $12 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (847) 679-8641

FOR SALE: CE-200V - $475; SX-100 - $250; Courier amp - $350; 75A4, 3.1 khz filter - $100; 8122s, NIB finals - $100 ea.; USM/3A multi-tester - $95. **WANTED:** Audio plugin module for CE-200V; spkr for NC-100X. Keith Perry, K7PSZ, 384 S 48th St., Springfield, OR 97478. (541) 726-1512, after 6PM PST

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

FOR TRADE: Harvey Wells AC PS for Elmac AC PS; custom 600W mod xfmr for 300W & parts; Lafayette HE80; Elmac AF67. **WANTED:** Homebrew xmtrs & rcvrs; swing link & coils; B&W JEL, BVL, TVL, HDVL 160; any BUD coils; 225W pwr resistors 5 & 10K; Spraque Black Beautys; Allen Bradley resistors; HV mics; doorknob caps; old style HV ceramics. **FOR SALE:** Collins 310B w/ant coil - $275; Gonset twins w/ps, mod, bracket - $265; Gonset IV 6 & 2 mtr xcvrs w/AC & DC cords, manuals - $450; Sam Champie, W7XXX, 105 W. McKenzie, Hermiston, OR 97838. Weekends only Please (541) 567-2879

FOR SALE: Drake R-4B, manual (copy) - $125. Mark S. Rauber, POB 1077, Minden, NV 89423. (775) 782-3596

FOR SALE: Galaxy III and V, also parts; 6M Clegg; Venus and Gonset Comm. IV. **WANTED:** ART-13 AC sply. Darryl, WA5AAO, TX, (409) 968-3384

TRADE: Drake collectors, I have super TR-3, will trade for equal TR-4. Darryl, WA5AAO, TX, (409) 968-3384

FOR SALE: Vibroplex key J-36, SN 1083, New York Mfg. 1942 - $125 + shpg. John, W3GDW, 215 William St., Trenton, NJ 08610. (609) 392-2095

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WAØAKG, NE, (402) 464-8682.

WANTED: Test equipment & tube audio amplifiers. Mike Nowlen, WB4UKB, 2212 Burgee Ct., Reston, VA 20191. mike@3dnet.com

WANTED: McKay Dymek radio literature & info. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182

WANTED: Collector/builder seeks Ige & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: Keys - keys - keys - keys - keys - keys - keys - keys - Jim, KØYLW, KS, (785) 364-3989

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1; 75S-3A, C 32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: Philco Radio model 37-660B, 37-630T or similar. Richard Beckett, WØBVT, R3113 Norma Ln., Ashland, MO 65010. (573) 657-2108, beckettr@missouri.edu

WANTED: Heath desk mic for Apache or DX100. Cliff, WA9SUE, WI, (608) 625-4527 after 6 PM.

WANTED: Collins 310B3 any shape; 70ESA oscillator assembly; and Chicago 500W CMS-1, high level modulation xfmr. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Hammarlund HQ180A or National NC303 rcvr. Must be in exc. condx. Bob, W7ZSB, UT, (801) 567-8894 or 943-7721

WANTED: Top $ for a Dow-Key bug and Philmore CR5 RX. Gary Wagner, K3OMI, 11124 Oak Hollow Rd., Knoxville, TN 37932. (423) 690-4217, days

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135

WANTED: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attwx.com

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: Navy xmtrs: MQ, TCA, TCE, TCN, TCX, TDE; rcvrs: RAW, RAX, RBD, RBJ. Steve Finelli, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211. navrad@enter.net

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

WANTED: Information-WW2 TCS Radio System: Design, Manufacturing & Operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 (message) greg6fzh@aol.com

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. (501) 318-1844, Fx 623-8783, james.true@ibm.net

WANTED: TMC GPT-750, TAC Tuner, GPR-90/92 & GSB-1. Alan Gray, W3BV, PA, (215) 795-0943.

WANTED: Limpanders or other equip by ESECO. Richard P. Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: Bandcoil sets for HRO-50 & HRO-60. Tom Bonomo, K6AD, CA, (650) 578-1897.

WANTED: TU-5-B tuning unit, 1.5-3 MHz for BC-375. Charles Lackey, W4QBE, 1252 Worley Creek Rd., Lakemont, GA 30557. (706) 782-3670

WANTED: Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031

WANTED: Dynamotor DM64 or DM66; also schematic for ARN-5C rcvr. Robert Martin, 111 Bancroft, Rochester, NY 14616. (716) 663-4182

WANTED: Drake SW-4 or SW-4A rcvr, very find condx only. Rick, N6NVG, CA, (925) 687-2719

WANTED: RME-4302, 6902 spkrs; manuals for a TS413 and Bogen K10 audio amp. Bill, KE7KK, 6712 Lake Dr., Grank Forks, ND 58201. (701) 772-6531

WANTED: Gonset G-76 xcvr. Vernon Fitzpatrick, WA8OIK, 520 Royce Rd., Hancock, MI 49930-2226. (906) 482-2128

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FOR SALE: Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip. ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

FOR SALE: SASE for list of reconditioned gear. Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

FOR SALE: Measurements 111B xtal calibrator - $25; connectors, meters, relays, xfmrs, manuals, books, list - $1. Joe Orgnero, 1349 Leask Rd., Nanaimo, BC V9X, 1P8, Canada. (250) 722-2707

FOR SALE: Version 3 of my communications, military & test equip list is available w/many new items & some reduced prices. Send long SASE, no sales until you receive my list. Ray Chase, 1350 Marlborough Ave., Plainfield, NJ 07060.

TUBE COLLECTORS GROUP FORMED: The new tube collectors associtation is now in operation. This is a non-profit, non-commercial organization of collectors & history enthusiasts focusing on all phases & vintages of tube design. The founding president of the group is Al Jones, W1ITX, who is known for his award winning tube collection. For more details & complimentary copy of the association's bulletin contact Al Jones, CA, (707) 464-6470, Ludwell Sibley, OR, (541) 855-5207, or mail request to POB 1181, Medford, OR 97501.

TRADE: Rare Brown Bros. BTL-A key for Vibroplex #130 or large, old straight key. Robert Enemark, W1EC, 15820 White Orchid Ln., Ft. Meyers, FL 33908. (941) 437-4490

FOR SALE: ARRL Handbooks 1936-1948, set of 8 - $120. Other Handbooks available. Thermal-electric generator from USSR in orig. crate - $250. Howard Hood, 5670 SW 44th St., Port Orchard, WA 98367. (360) 674-2179

FOR SALE: HQ-129X, good radio, cabinet fair, front panel a couple of scratches - $125; NC-125, good radio - $150. Prices include shpg to the 48 states. Don Dillard, 5106 Red Oak Dr., Amarillo, TX 79110. (806) 352-4776

FOR SALE: HQ-120X - $135; BC-779-Hammarlund - $150; HT-32 parts. Plus shpg. WANTED: PE73-C dynamotor. W7RBF, AZ, (602) 864-9987

FREE: Encyclopedia of Amateur Radio Equipment. Hundreds of photos & descriptions spanning over 80 yrs. http://www.aade.com/hampedia/hampedia.htm

FOR SALE/TRADE: Transmitting/Rcvg tubes, new & used. 55¢ LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: (2) good RCA 833A's for one Taylor 833A. Also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

TRADE: My AN/PPN-2 Eureka Paratroop beacon for your wireless set (Canadian) 29A set. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE: Military and commercial communications items: www.maxpages.com/murphyjunk. For up to date lists: murphy@cts.com. Mike Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

FOR SALE: Collins W/E 30S1 - $1575; 212S1 - $295; Wireless Set 19 MKII parts unit - $95; Scott RBO - $225; Ameco 6/2M (2) - $95, $50. PU on lge items. Michael Behar, WM1O, 17 Gerlach Pl., Larchmont, NY 10538. (914) 834-7678

FOR SALE: HRO-50T1, calib., spkr - $400; Gonset G-76, AC sply - $225; Millen 4KW Transmatch - $245. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (973) 728-2454

FOR SALE/TRADE: Manuals for Allied/Knight, EICO, Lafayette, B&K, Clegg, SBE, Polycomm, Comcraft, McMurdo Silver, others. NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: Ceramic sockets, EF Johnson (new), octal to 50 watters. SASE for list. Bill Riley, W7EXB, 863 W 38th Ave., Eugene, OR 97405-2375. (541) 345-2169

FOR SALE: NC-183D, a 9.5, slight scratches on lid - $250; NC-46, clean - $65. Tommy, Waco TX, (254) 754-4064 after 6:30PM

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FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: Books, all electronics related; 200 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. watok@email.msn.com

FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@rust.net

FOR SALE: Our new 1999 54 pg. catalog of WWII communications items - $3. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

FOR SALE: Boatanchor paints; Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

FOR SALE: Valiant - $350; Ranger - $250; R-390A - $350; R-391 - $300; R-1051B - $300; Dentron Clipperton L linear - $250; Nye Viking MB-4A tuner - $500; Johnson 6N2 - $150; Heath DX-60B & HB-10B VFO - $150. PU only. John Spielmann, WB2SMA, 423 Line Rd., Aberdeen, NJ 07747. (732) 566-1312, jassma@aol.com

FOR SALE: Drake TR4CW xcvr w/RIT, MS4 spkr, pwr sply & outboard digital freq. display - $400 plus shpg. John Peterman, W9VG, WI, (414) 486-7997

FOR TRADE: NOS sweep tubes—6LQ6, 6JE6, 6JS6, 6KD6, etc. for NOS 6L6G, 6V6G, 6U5. Dan Gutowski, 9753 Easton Rd., Dexter, MI 48130. (734) 433-1354

For Sale
Cliff's Collection

Receivers: SP-600JX-21, R-390A, R-390, R-388 w/prod detector & hang AGC, HQ-145A w/prod detector, HQ-100 w/spkr, S-36A, 28-144 mc, Rycom 2170, 3 kc-200 kc.
Test equipment: General Radio 434B audio oscillator, 667A inductance bridge, 1142A freq. meter, 1390A random noise generator, 1652A resistance limit bridge. Boonton 91C RF voltmeter, 160A Q-meter. Measurements Corp 80 HF signal generator, 82 signal generator. TEK 512 scope, 321 portable scope, 545 scope, 555 dual beam scope, 561A scope, many plugins. HP signal generators—606A, 608C and at least 3 each of the entire sires up thru 21 GHZ. Empire Devices NF-105 Field Strength Meters, complete w/all acc.
Misc: blank rack panels, rack cabinets, power supplies, parts transmitters, towers, masting, cable, coax, multi-conductor cable and much more.
Send LSASE for long list.

Chuck Felton, PO Box 187,
Wheatland, WY 82201.
(307) 322-5858
feltoned@coffey.com

FOR SALE: Central Electronics 100V in very good condx - $325; General Radio 1931-A mod monitor w/orig. manual, working - $110. U-ship each. Omar de la Rosa, KQ6IG, 485 E. Julian St., San Jose, CA 95112. (408) 287-5775 (d), 292-2738 (eves)

FOR SALE: WRL Globe King in nice condx - $200 PU only. Dave, KB4AI, 2531 Garrisonville Rd., Stafford, VA 22554. (540) 752-0760

FOR SALE: #19 MKII; Hallicrafters S38E & S40B. **WANTED:** Control box for AN/SRA-17 antenna system. Tom Brent, Box 1552, Sumas, WA 98295-1552. (604) 826-4051

FOR SALE: Hallicrafters 8-R-40 rcvr - $75; Heath DX60 xmtr - $75. Don, W7KCK, OR, (503) 289-2326

WANTED: Homebrew preselector 80-10 meters from QST article, preferably tube type. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM.

WANTED: Zenth 5s126, 6s222, 5s128; military BC-652, BC-653; any spy radios. Gary Cain, 202 W. 5th Ave., Shakopee, MN 55379. (612) 496-3794

WANTED: WW II Japanese military radio of any kind and Hammarlund PRO-310. Takashi Doi, 1-21-4, Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069, taka-doi@a2.ctktv.ne.jp

WANTED: Bliley VF-1 xtals; Temco 75GA or Supreme AF100 xmtr. Robert Perlstein, W1IV, POB 642, Old Orchard Beach, ME 04064. (207) 934-9206 perls@compuserve.com

WANTED: National SW-3 w/PSU & at least 1 ham coilset preferred. Roberta Barmore, KB9GKX, 717 E 60th St., Indianapolis, IN 46220. rbarmore@indy.net

WANTED: Cabinet for Johnson Invader; Heath 6W-10 CB R16. George N2GBY, NJ, (609) 848-6699

FOR SALE: Salvaged pwr xfmrs, filter chokes from tube jukebox amplifier, TV's & radios. SASE for list, specs. Also monotube type audio amplifiers; Stromberg Carlson SAU 33 Signet, 6L6, 25W - $60. David Bogen Challeneer CHA 33, 33W 6L6s - $75. All plus UPS. Onerio Sabetto, 1717 Burgess Rd., Cleveland, OH 44112. (216) 481-1036

FOR SALE: ATD dynamotor, new; DM-42 dynamotor. **WANTED:** Junker APR-4; junker BC-348; DM-21 dynamotor; DM-24 dynamotor; working RF tuner for R220 rcvr. Dean, 6725 Portland, Richfield, MN 55423. (612) 869-9264

FOR SALE: HQ-170 parts unit - $45; Johnson Valiant - $300; DX-100, restorable - $50; NC-300, restorable - $75; SX-28, rackmount - $250. Marty, NJ, (609) 466-4519

FOR SALE: 1939 Japanese 0-200 mA meter - $200; Federal Telegraph 128AY marine regen rcvr - $250. Gary, WA9IYF, 169 North Ridge Rd., Versailles, IN 47042.

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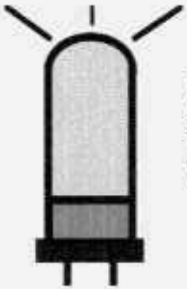

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